DIET
IN
SICKNESS
AND IN
HEALTH

MRS. ERNEST HART

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BY

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WITH AN INTRODUCTION BY

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AUTHOR'S PREFACE.

In presenting this book to the public I am actuated by the hope that it will prove useful to those who are sick, and to those who have to nurse, feed, and prescribe for the sick, and that it will aid the healthy to preserve health. Believing that lay readers will act with greater intelligence if they understand the rationale of a diet, I have briefly described in each case the accepted causation of the disease, and the reasons for the special diet prescribed. Medical men will also, I trust, find the dietaries and recipes practically useful, and likely to save them trouble in directing the dietetic treatment of patients. I have to acknowledge my indebtedness to the works of Dr. Pavy, Sir W. Roberts, Dr. Burney Yeo, Sir Henry Thompson, Dr. Cheadle, Dr. Haig, and those of other writers on dietetics; also to thank Dr. Donald Macalister for his great kindness in reading the proofs. I feel pride and pleasure in the endorsement of the value of the book by so eminent an authority as Sir Henry Thompson.

ALICE M. HART.

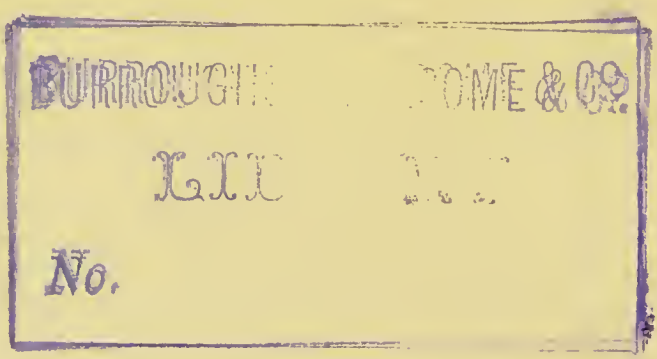
38 Wimpole Street, W.

INTRODUCTION.

In few departments of medical knowledge are precision and resource more desirable than in that of medical dietetics. The selection and prescription of foods for the delicate, the sick and the aged require not only a knowledge of the leading features of the varied nutritional derangements presented, but also the faculty of perceiving what modifications may be necessary for each individual case, since almost every patient has his personal peculiarity to be ascertained and provided for. The first thing necessary for "food and feeding in health and disease" is to be well instructed in the elements of physiology, the nature of foods, and the normal laws of feeding, as well as in the deviations by which the action of these laws is modified. To this must be added some practical acquaintance with kitchen usage and processes. A certain familiarity with the resources of the cook is essential to furnish a suitable daily *ménu*, which shall be agreeable to the invalid, and as much as possible varied within the narrow limits which are dictated by the circumstances of each case. No man is a really accomplished physician or surgeon who has not made dietetic principles and practice an important part of his

professional education. I do not hesitate to express my opinion that the present volume forms a handbook to the subject, thus briefly set forth in these few lines, which will not only interest the dietetic student, but offer him, within its modest compass, a more complete epitome thereof than any work which has yet come under my notice. It is so because its accomplished authoress has the advantage of possessing not only a remarkable acquaintance with the various branches of medical knowledge, after many years devoted to their study, but also in no less degree that which has been conferred by long culinary and housewifery experience. I can strongly commend this book, therefore, as supplying an important want in our educational literature.

HENRY THOMPSON, F.R.C.S., M.B., Lond.



DIET IN SICKNESS AND IN HEALTH.

CHAPTER I.

FOOD AND FOOD VALUES.

The Albuminates.

Before entering on the consideration of questions of Diet and Dietetics, it is of the first importance that the processes of digestion and assimilation of food in the body should be thoroughly understood, as well as the composition and the exact values of those foods which serve to build up the body after wear and waste, and to maintain it in a condition of health. I will, therefore, commence by giving a brief description of the constitution and dietetic values of the various kinds of food which form the mixed diet of an ordinary European, and also some account of the processes of digestion, absorption, and excretion.

The human body is composed of the following elements:—Carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, chlorine, iodine, potassium, calcium, magnesium, and iron. The first four are present in far larger proportion than the rest. In order that the body may be reconstituted and nourished, all these elements must be represented in the food of man.

Food is composed of organic and inorganic materials. The organic materials are furnished both by the animal and the vegetable kingdom, and are composed of the following elements:—Carbon, hydrogen, oxygen, nitrogen, sulphur, and phosphorus. Of these, oxygen is necessary

for the oxidation of the tissues, that is to say, for their combination with oxygen in the processes of life and function; carbon is necessary for the production of heat, which is caused by the combination of carbon with oxygen to form carbonic acid gas; hydrogen is necessary in order to combine with oxygen and form water; and nitrogen is all-important, as it is the essential element in the composition of the living tissues of the nerves, muscles, brain, and blood, as well as of the secretions and juices of the body. Its presence is also necessary in all the vital processes, for without it no energy can be produced, nor can any of the changes take place which are characteristic of the living state in the body.

Foods are divided into nitrogenous and non-nitrogenous, according as they contain the element of nitrogen or not. In the following table the various principles of food are classified and arranged:—

Nitrogenous	1. Albuminates . . .	Albumen Fibrin Casein Gluten Gelatine
Non-nitrogenous	2. Fats, or Hydro-Carbons	Oil Butter Margarine, etc.
	3. Carbo-Hydrates . .	Starch Dextrine Cane-Sugar Grape-Sugar or Glucose Milk-Sugar or Lactose
	4. Stimulants	Alcohol Tea Coffee Cocoa
Inorganic	Water. Vegetable acids: Acetic, Tartaric, Citric, and Malic Acids. Salts: Chloride of Sodium (common salt), Chloride of Potassium, Carbonate of Calcium (lime), Phosphates of Calcium and Magnesium, etc.	

The albuminates contain about 15 per cent. of nitrogen. The following analysis by Malder clearly explains their composition :—

Nitrogen	15·5
Carbon	53·5
Hydrogen	7·0
Oxygen	22·0
Sulphur	1·6
Phosphorus	0·4
	100·0

Albumen is composed of carbon, oxygen, hydrogen, nitrogen, with some sulphur and phosphorus. It exists in its purest form in the white of an egg, and is characterised by being coagulable by heat. Albumen is an important constituent of all flesh foods, and of eggs and milk. It is also present in a great number of vegetable products, and is found in wheat, oats, Indian corn—hence in bread, oatmeal, and Indian meal—in barley, rye, rice, buck-wheat, beans, peas, lentils, bananas, potatoes, almonds, and nuts, and in small quantities in carrots, parsnips, turnips, and artichokes. It is present in its most digestible form in the flesh of animals. Some vegetables contain albumen in large quantities ; and, as constantly insisted upon by vegetarians in support of their views, there is a larger amount of albumen in a pound of peas than in a pound of beef.

Fibrin is almost identical with albumen, but it contains more oxygen and sulphur. It is a constituent of the blood, and undergoes spontaneous coagulation out of the body.

Casein is a component of milk, from which it is thrown down by the action of an organic acid, such as rennet. It is casein which constitutes the curd of milk, the curdling being effected by the production of free lactic acid during the process of the souring of the milk. Casein is also the basis of cheese, and in this form it is a highly nitrogenous food. Besides the four elements, carbon, oxygen, hydrogen,

and nitrogen, casein also contains sulphur, but no phosphorus ; and it is remarkable for the large quantity of phosphate of lime which it is capable of holding bound up with it, and for the tenacity with which it retains it. (Pavy.)

Gluten is the tenacious, sticky material which is left when flour is kneaded with water and afterwards washed to remove the starch. According to the report of the Paris Gelatine Commission, which sat for ten years making continual researches on the value of the albuminates and gelatine as articles of food, it is stated that gluten is alone necessary to support life. This assertion has since been disputed. To gluten, however, bread, the staff of life, owes its high nutritive qualities.

The Meaning of Metabolism.

The albuminates, or nitrogenous foods, were formerly designated by the older writers on dietetics as *flesh-formers*, the hydro-carbons, or non-nitrogenous foods, being classified as *force-producers*. Recent researches have, however, shown that this sharp division of foods into nitrogenous, or flesh-formers, and non-nitrogenous, or force-producers, cannot any longer be maintained. It has been proved by experiment that the muscles do not undergo waste during exercise, which waste has to be restored by nitrogenous food, in anything like the degree which was formerly thought and taught by Liebig. In fact, the amount of tissue waste in muscular exercise is small, and hence the amount of nitrogenous food necessary for repair is also small. The life and health, however, of all the organic nitrogenous tissues, fluids, and secretions can only be maintained by constant change. As the blood circulates through the body, carrying the elements of nutrition to the furthermost limits of the tissues, it modifies all with which it comes in contact ; here parting with some element in order to promote cell secretion or nutrition, there taking up products destined either for excretion or for further elaboration. In

order that these constant cell changes, this production of secretion and excretion, these processes of elaboration and assimilation, which constitute the actual art and method of life, should go on, the presence of nitrogen is necessary. Hence one of the great uses of albuminates in the food is to provide the nitrogen necessary to promote the changes of nutrition in the body. This process is called metabolism. Thus we see that albumen is a necessary food, not only in that it repairs tissue waste, but also because it plays a large part in the production of functional activity and energy. Without albumen, the rapid tissue changes necessitated by great activity of body could not take place; hence races and persons who live on a non-albuminous diet are inert, wanting in vigour and initiative. Change their diet and you are often able to change their character. Thus the potato-fed Irishman, on his damp soil, is said by those who employ him in manual labour to have "no heart in him"; but transport him to a stimulating climate, and make of him a beef-fed American, and his energy becomes sustained and even sometimes excessive. Albumen is, moreover, capable, it seems, of being split up by the agency of the cells in the body into nitrogenous and non-nitrogenous principles; for we find that when an animal has been fed exclusively on albumen, both fat and sugar have been produced from this food within the body, and hence it is possible that albumen may under certain conditions also play the part of a force-producer, force being produced, as I will show later, by the combustion of fat and sugar in the body.

To sum up: **The uses of albuminates in the body** are threefold, *viz.*: (1) To repair the waste of those tissues which contain nitrogen, *viz.*, the muscles, nerves, brain, etc., and to reconstitute the secretions and fluids of the body, and the digestive juices; (2) to control, stimulate and support the vital processes of functional activity and nutrition, and to promote oxidation in the body; (3) to contribute to the development of muscular and nervous energy, by splitting up into nitrogenous and non-nitrogenous elements, by the

production of heat, and under certain conditions by the formation of fat.

Do the English Eat too much Meat?

The amount of albuminous food necessary.—A certain amount of albuminous food is necessary for the repair of the body, which is wasted, even in those who live sedentary lives, by the constant activity and change taking place in the organs; but there is but little doubt that the quantity of flesh foods generally consumed by the well-to-do Englishman, is far in excess of the amount of nitrogenous material required to repair tissue waste and to promote secretion. The exact amount of nitrogenous food necessary to barely support life, or to maintain the body in health with a moderate amount of labour, or on which to do hard labour, such as that performed by a navvy or engineer, has been accurately determined by experiments carried out on a large scale in armies and prisons. Thus a prisoner sentenced to less than seven days' imprisonment without hard labour is fed on 1 lb. of bread, with two pints of oatmeal gruel made of 2 oz. of oatmeal to the pint. For twenty-one days' imprisonment the bread is increased to 1½ lbs. a day. The amount of nitrogenous material in this diet is only 2½ oz. It is the lowest diet on which life can be maintained compatible with health, but without hard labour. An English soldier on home service receives 1 lb. of bread and ¾ lb. of meat, which represents nearly 4 oz. of nitrogenous material. For hard labour the nitrogenous material should be increased to nearly 6 oz., which would be represented by about 1½ lb. of bread and 1 lb. of meat. From these facts the conclusion will, I think, be easily drawn that the ordinary Englishman and Englishwoman of the middle classes, who perform no hard labour, and who live, as a rule, sedentary lives, consume far too much nitrogenous food in the meat, bread, eggs, milk, and fish taken in three square meals a day. In the accounts of centenarians

recently collected by Sir George Humphry, it was shown that those who reached advanced old age in good health were those who lived sparingly.

What becomes of the albumen.—The albumen which is taken with the food undergoes, after digestion, and the assimilation of the elements necessary for tissue construction, retrogressive changes, and it is finally thrown into the blood in the form of **urea.** This urea must be excreted by the kidneys, and therefore if an excess of albuminous food is taken, a great burden is thrown upon the kidneys, which may result in producing disease in these organs. In youth, when growth is rapid, a much larger amount of nitrogenous food is required than in old age, when tissue change is slow. Also, those engaged in hard labour require and can dispose of without detriment to their health, a larger amount of nitrogenous food than those who live sedentary lives.

Gelatine is derived from bone and fibrous tissues by boiling. It has the property of solidifying into a jelly on cooling. It approaches an albuminate in chemical composition, and is rich in nitrogen. It cannot, however, replace albumen in the repair of tissue waste, as it rapidly undergoes change in the body and is eliminated as urea. But just because it undergoes changes so rapidly and easily in the body it may be taken as a substitute for albuminates when stronger foods containing albumen cannot be tolerated. This is the rationale of the use of beef-tea—which is simply gelatine—in cases of acute sickness, when meat cannot be digested. It also contributes to force production.

CHAPTER II.

FOOD AND FOOD VALUES—(*continued*).

Hydro-Carbons and Carbo-Hydrates.

Fats—Sugar—Starch.

In the group of hydro-carbons or fats are included all vegetable and animal fatty foods, such as oils, suet, butter, etc.

The value and necessity of fat as an article of food is obvious from the fact that the outer covering of the body beneath the skin is composed of fat. It is fat or adipose tissue which gives the rounded form and curved lines that constitute, according to our ideas, one of the essentials of beauty, and it is moreover this outer covering of fat which protects the body and organs from sudden changes of temperature.

Fat is in constitution a much simpler food principle than the albuminates, and it is shown by analysis to be composed as follows :—

Carbon	79
Hydrogen	11
Oxygen	10
	100

The uses of fat.—We all know that combustion is caused by the combination of the oxygen of the air with the freed carbon of the substance which is being consumed. It was taught by Liebig that fat split up in the body, and that the freed carbon combined with the oxygen which is

taken into the lungs in respiration, the result being the production of carbonic acid (CO_2), and that it is by this act of respiratory combustion in the lungs that the body heat is maintained. Fatty foods were hence considered necessary as heat-producers. Recent investigations have, however, proved that the matter is not so simple, and that though fat is split up and combined with oxygen in the production of heat, especially during muscular exercise, the process is effected in the tissues by the action of the cells, and not in the lungs, as formerly taught. The use of fat seems to be threefold. (1) To maintain the body heat. In cold latitudes, where the body is subject to rapid cooling, fatty foods become a necessity, so that the carbon may be easily supplied for combination with oxygen in combustion. Hence the Greenlander consumes large quantities of blubber and oil. (2) To produce force. As muscular force is only produced at the cost of oxidation in the tissues, fat is rapidly burned off during exercise. If fatty food is absent, the tissues themselves would be wasted. This fact, well known to every athlete and mountaineer, brings us to the third use of fat, *viz.* (3) To prevent the waste of albumen. If albuminous food alone be given, a very large amount must be consumed for the body to obtain the elements necessary for the production of heat and mechanical energy ; but if fat be added a much smaller amount of albumen is required. Hence we see that there is no diet so wasteful as a purely albuminous diet. It has been moreover conclusively proved experimentally that a small amount of meat food taken in combination with bread and fat, suffices to maintain the albuminous structures of the body better than an exclusively lean meat diet.

Fat stored in the body as adipose tissue is a bank on which the body may draw for supplies of energy and heat when required. During great muscular exercise fat is rapidly broken up into its component elements and oxidised, and in the case of enforced starvation the body finds in adipose tissue the materials for its own support. It is

stated that in the Franco-German War of 1870, the German Emperor, acting on the strongly expressed opinion of Ebstein that muscular fatigue could best be supported on fat, gave orders that each soldier should have served out to him 250 grammes of fat bacon. It is a well-known fact that fat animals bear privation of food better than thin ones. Hybernating animals during their winter sleep live on the fat stored in their tissues, and awake in spring with their bodies almost devoid of fat.

The carbo-hydrates include starch, sugar, and dextrine. Hydro-carbons and carbo-hydrates resemble each other in being entirely free of nitrogen, and in being composed only of the three elements of carbon, hydrogen, and oxygen ; but they differ in that in the carbo-hydrates, hydrogen and oxygen always exist in combination with the carbon in such proportions as to form water. The chemical formula of water is H_2O ; the chemical formula of starch is $C_6H_{10}O_5$; from which it will be seen that starch is composed of six atoms of carbon and five molecules of water. The various substances in the group of carbo-hydrates, such as starch, dextrine, and sugar, are easily convertible one into the other by the action of ferments, as will be shown subsequently in describing how in the process of digestion insoluble starch is converted into soluble sugar by the action of ferments in the saliva and pancreatic juice. The principal carbo-hydrates used in the food of man are starch, and the various kinds of sugar. Starch is contained in all farinaceous foods, and in many vegetables, such as peas, beans, and potatoes. Sugar is found in the form of cane-sugar in the sugar-cane and beetroot, as milk-sugar or lactose in milk, and as grape-sugar or glucose in fruits. Considering, therefore, how largely our ordinary food consists of bread, potatoes, milk, and sugar, it will be seen that the carbo-hydrates form very important elements in diet.

How carbo-hydrates produce power.—It is taught generally that the action of carbo-hydrates is that of *power-*

producers in the body ; that is to say, that during muscular contraction, or in fact, in order that it may take place, a carbo-hydrate must be split up in the body, and its element of carbon combined with oxygen to produce carbonic acid (CO_2). A muscle may be compared to a steam engine. The muscle fibres, composed of an albuminous material, correspond to the brass and steel of the engine. In order that the steam-engine may work, coal has to be burnt to produce power ; and in the same way, in order for a muscle to work, carbo-hydrates have to be burnt to produce energy. Owing to constant use, some of the metal parts of the machine wear away, so do some of the constituent parts of the muscle, and the refuse is thrown into the blood in the form of urea. In the engine, the rapid firing necessary for working at high pressure does not wear away the machine, but the consumption of coal must be increased, and the production of carbonic acid much augmented, in the production of increased power. This is exactly what takes place during severe muscular exercise. The albuminous constituents of the muscles are not worn away, but the muscle requires the fuel of carbo-hydrates or of hydrocarbons in order that the required carbon may be oxidised in the production of mechanical energy. This rapid oxidation is the cause of the increased heat of the body during muscular exertion. The carbonic acid produced is excreted by the lungs. In the experiments made by Dr. Edward Smith on himself, it was shown that five times as much carbonic acid is exhaled when walking at the rate of three miles an hour, as during sleep, and twice this amount while working the treadmill, in which enforced exercise all the muscles of the body are continuously at work. From experiments made by various scientific observers in the ascent of mountains on a strictly non-nitrogenous diet, it has been ascertained that severe muscular exercise and fatigue can be well borne on a diet of carbo-hydrates only ; in fact, it is now well established that the energy or power developed by muscular work in the body is pro-

duced by the oxidation or burning off of carbonaceous matter. Hence it results that fatty and starchy foods form an excellent dietary on which to do hard physical work.

In order that carbo-hydrates may be digested and assimilated, it is necessary that they should be converted into glucose. This is brought about by the action of the saliva and of the pancreatic juice, and will be described when digestion is treated. The carbo-hydrates do not act only as energy-producers in the body; they also contribute to the formation of adipose tissue.

The production of fat from starchy and sweet foods has been very much discussed, and a great number of experiments have been undertaken on living animals to determine whether this transformation does or does not take place. The experiments by Huber, Grundlach, Dumas, and Milne-Edwards have proved that bees can manufacture the wax of the comb out of a diet of pure sugar or honey. From the observations of Persoz, a Professor of the Faculty of Science of Strasburg, on the production of *foie gras*, or fatty liver, in the Strasburg geese dedicated to the production of this pathological dainty, he found that far more fat was manufactured in the bodies of the geese than could be accounted for by the oily matter of the maize on which they were fed. The following record of an experiment by Tscherwinsky on pigs is also very conclusive. He took two pigs; No. 1 weighed 7300 grammes, No. 2, 7290 grammes. No. 1 was killed, and the fat and the albuminous constituents of its body were carefully weighed. No. 2 was kept four months and fed on an exclusive diet of grain. The animal was then killed. The amount of grain it had taken and the amount of albumen contained in the grain were carefully estimated. Its excreta were also analysed. After the pig was killed the amount of fat and albuminous substances contained in the body were estimated. The amount of fat that had been produced by the diet of

grain could be ascertained on comparing pig No. 1 with pig No. 2. The following table gives the result:—

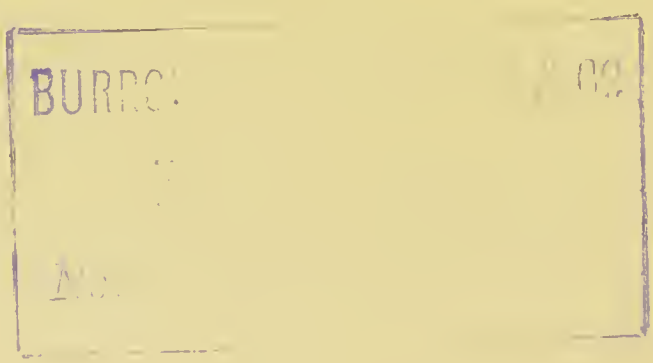
Pig No. 2 contained	2·50	kilos	of albumen and	9·25	kilos	of fat.
Pig No. 1 „	0·96	„	„	0·69	„	„
Assimilated	1·56	„	„	8·56	„	„
Taken up in food	7·49	„	„	0·66	„	„
Difference	5·93	„	„	7·90	„	„

It will thus be seen that only a small part of the albumen of the food was assimilated, or incorporated in the structure of the animal, but yet there was an increase of nearly 8 kilos of fat. Whence was this fat derived? The albumen which was not assimilated could, by splitting up, only furnish a very small part of it; and therefore the conclusion is inevitable that it was produced from the starch of the grain. How fat is produced from starch and sugar in the body is at present entirely unknown. The body is a laboratory of far greater complexity than the most perfectly fitted laboratory of the man of science. The cells of the liver, the pancreas, and the muscles exercise wonderful powers in splitting up complex bodies into their component elements, and in re-combining these elements into new substances. After the most careful experiments have been made on the living body, the actual processes of life escape our detection and investigation; hence we do not actually know, we can only guess at the truth, and argue from the results of broad and coarse experiments.

Though it is now ascertained beyond dispute that fat is produced from carbo-hydrates, it has been proved by experiment that the production of fat is much more rapidly and easily effected if the carbo-hydrates are not given alone, but in conjunction with a small amount of fat. Thus Boussingault found that if pigs were fed exclusively on potatoes they would not fatten beyond a certain point; but if fed on potatoes mixed with wash, which contained a quantity of nitrogenous and fatty refuse thrown out of the

kitchen, they fattened freely, and the fat which was produced in their bodies was ascertained to be greatly in excess of that given with the food, whence it was concluded that the small amount of fat and albumen ingested enabled the body to turn the starch of the potatoes into fat with greater ease.

Cellulose, which is the basis of construction of all plants, is a carbo-hydrate which the human system is incapable of digesting. It is the indigestible cellulose of vegetables and fruits which gives rise to indigestion in persons of weak stomachs after they have eaten uncooked salads, etc. By cooking, cellulose is rendered soft and less injurious. Persons with weak digestions should therefore always eat fruit, vegetables and salads cooked. Cellulose forms, however, the bulk of the food of the herbivorous animals, in whose digestive system special arrangements are made for its digestion and assimilation. It is a matter of current observation that cows and horses will fatten on grass and hay, and their bodies must therefore have the power of converting the carbo-hydrate cellulose into fat. If, however, it is intended to produce an excessive deposit of fat, cattle are fed upon maize or oil-cake, in which the presence of oily substances contributes to the increased production of fat from the other constituents of the food.



CHAPTER III.

STIMULANTS.

Alcohol.

There is no subject respecting which such opposite opinions have been expressed as on the value of alcohol as an article of diet; and there is also no subject on which it is more difficult to express an unbiassed opinion, based on the clear and unmistakable evidence of science.

Is alcohol a food?—This has been seriously denied by some scientists, who have sought to prove, in support of their assertions, that all the alcohol taken could be recovered again in the breath, the perspiration, and the excretions; and hence that it played no part in tissue change. This, however, is not the fact. Only a small amount of the alcohol taken can be recovered, and the question remains — What becomes of it in the body? Dujardin-Beaumetz, the French physician and pharmacologist, gives the following answer to this question, basing his opinions on practical experiments. He states that if alcohol is taken in small quantities it passes into the blood, where it acts upon the red blood corpuscles, which are, as is well known, the oxygen-carriers of the body, and it obliges them to part with their oxygen. By this action, alcohol diminishes the oxidation of the tissues, and is therefore, though not a true food itself, a substance which lessens the necessity for food, thus being what he calls *un aliment d'épargne*, or, as we may translate it, an economiser of food, or a tissue waste-preventer. If taken in large quantities, too much oxygen is extracted from the blood corpuscles

and the temperature of the body falls, owing in part to deficient oxidation. If taken in still larger quantities, the whole of the alcohol does not undergo combustion, but, circulating freely in the blood, acts directly on the cerebro-spinal system, producing excitement, narcotism, and the symptoms of intoxication.

The effects of alcohol.—Alcohol has the effect of stimulating the cardiac centres and of increasing the number and volume of the heart-beats, and also of dilating the arterioles, thus temporarily producing a sensation of warmth and comfort frequently succeeded by chilliness, which is caused in some measure by the greater surface of blood exposed to the influence of skin radiation. The lowering of the temperature of the body by large doses of alcohol is a well-known fact, and alcohol consequently was at one time advocated and used by certain physicians to reduce the temperature in acute fevers. This method of treatment has now been discontinued, as it was found that the remedy was as bad as the disease; and that in reducing temperature by alcohol, which is less certain in its effects than other available antipyretics, various morbid conditions and complications were produced. The depression of temperature in the coma of intoxication is, moreover, so well known to the persons who have to deal with these unfortunate cases, that in the Glasgow lock-ups, large fires are kept alight on Saturday nights, before which dead-drunk persons brought in may be laid, in order that they may not perish of cold. Alcohol is one of those strange substances which have the power of producing apparently opposite results. In small quantities it stimulates the action of the heart, in large it depresses it; in small quantities it increases the secretion of gastric juice, in large it destroys the pepsin and arrests digestion; in small quantities it has an exhilarating effect on the nervous system, in large it is narcotic. If, therefore, the production of the stimulating action of alcohol be required, the question which it is important to answer is,—What is the

amount which can be taken without exceeding the narrow limit beyond which alcohol is harmful?

The amount of alcohol which can be taken with impunity.—There is a general consensus of opinion on the part of physicians that from 1 to 1½ oz. of pure alcohol is the maximum amount which a healthy man should take in twenty-four hours. Translated into common parlance, this means from 2 to 3 oz. of brandy or whisky, from 4 to 6 oz. of port or sherry, from 10 to 15 oz. of champagne or burgundy, or from 1 to 1½ pints of beer or porter. More than this is harmful. Persons under forty years of age, in whom the digestive functions are normally performed, and who show no signs of nervous disturbance or degeneration, do not generally require alcohol at all, and are healthier and better, and are likely to live longer without it. For persons over forty, in whom digestion has become impaired by anxiety, confinement in close rooms and offices, or by sedentary or unhealthy occupations, or in whom nervous energy is exhausted or deficient, a small amount of alcohol in the form of wine or beer, taken with the food, is a useful stimulant. By its influence the secretion of gastric juice is increased, and digestion thereby promoted.

The almost universal use of fermented alcoholic drinks with meals, in all times, nations and ages, and the facility with which the fruits of the earth ferment and produce alcohol, seem to point not only to a human need, but to the supply of such a need by Nature. Alcohol is, however, like many of the other gifts of Nature: its use is beneficial, its abuse baneful. It is, in fact, a matter of common experience that, when taken in moderate quantities, "the appetite is augmented, digestion is promoted, the nervous system stimulated, and the mental faculties exhilarated by alcohol" (Pavy). Dr. King Chambers picturesquely puts it: "That everybody recognises in alcohol a power of blunting sorrow and pain, of checking the sensation of weariness, mental and bodily, of taking the points off the stings and buffets, discomforts and nastiness of daily life;

but also of corrupting the delicate appreciation of its higher delights; in short, of diminishing the sensibility to impressions in mind and body, and of lowering the receptive functions of the nervous system;" and he urges that for healthy persons alcohol should never be taken as a stimulant or preparation for work, but only as a defence against the injury done by work, whether of mind or body, and that it is therefore best taken with the evening meal or after toil.

The pernicious habit of taking nips.—Whatever may be the opinion or judgment, based on experience or science, as to the value or uselessness of taking some form of alcohol with the meals, there is no doubt in anybody's mind that the custom of taking wine or spirits or beer between meals and on an empty stomach—in one word, the pernicious habit of "nipping"—is highly injurious. The morning nip, between breakfast and the midday meal, which is so frequently taken by domestic servants, nurses, workpeople, and "City men," renders the taker less fit for his daily work than he would otherwise be; and it is often in women the first fatal step towards dram-drinking, and the shameful life of the woman-drunkard, of whom we hear and see so much at the present time. The flushing of the face, caused by the dilatation of the small blood vessels, and usually induced by alcohol when taken alone, is symptomatic of what takes place in the stomach. The direct action of alcohol on the mucous membrane is to produce temporary congestion or blushing of the internal surface of the stomach. This congestion ultimately becomes chronic if "nips" or "drams" of spirits are frequently indulged in, with the result that the mucous membrane becomes thickened and indurated, a quantity of tenacious mucus is secreted, the digestive ferment is paralysed or destroyed, and alcoholic dyspepsia is established.

Does alcohol give strength?—In contradiction of the popular fallacy that spirits and beer give strength and enable a man to do his work better, there may be quoted the experience of soldiers on the march in the tropics, of

explorers toiling day after day across the frozen oceans of the North Pole, of Alpine climbers undergoing great fatigue. In all these instances the conclusive and invariable experience is that alcohol taken in any form during the period of exertion, causes increased fatigue and depresses the spirits. On the other hand, in the opinion of many, a small amount of alcohol, taken after the work of the day is done, proves sedative and harmless.

The use of alcohol in disease.— Much as opinions may differ, however, respecting the value of alcohol as an article of diet in health, or in a condition of slightly impaired health and vigour, there can be no doubt that in the hands of the physician alcohol is one of the most valuable drugs he possesses. In the period of depression and "resolution" of acute pneumonia, in syncope, in the sudden enfeeblement of the heart from fright, accidents, or loss of blood, in ischæmia of the blood vessels of the brain, in acute fevers when the heart must be supported, in collapse, and in certain degenerative nervous and cutaneous diseases, alcohol is invaluable, and there is no drug in the pharmacopœia which can take its place. But even in these cases it must be used with caution and under medical advice, and it may be accepted as an axiom that small doses frequently repeated are always more efficacious and less dangerous than large doses at long intervals. The pulse is to the physician and to the intelligent nurse watching beside a patient in a state of profound depression, the indication of the amount and the frequency of the dose of alcohol to be administered. I have within my own experience seen, more than once, a patient pulled through the imminently fatal exhaustion of acute pneumonia during the period of the rapid fall of temperature, by minute and oft-repeated doses of brandy, given immediately the pulse was felt to flag; and I have seen similar cases die for the want of the use of alcohol at this critical time. In the debility of convalescence, "a little wine," recommended by St. Paul to Timothy "for the stomach's sake," may promote digestion

if taken just before meals: but this is again a matter for the physician to decide.

The evil effects of alcohol when taken in excess are notorious, and I need not enlarge upon them here. It is the abuse of alcohol which fills our hospitals, our prisons, our lunatic asylums, and our workhouses; it is the fertile parent of vice and crime, the foster-mother of pauperism, and the constant generator of chronic poverty. But besides the evils which can be traced directly to dram-drinking, tippling and excess, who can gauge the number of cases in which the bread-winner dies from acute disease, from which the alcoholic habit deprives him of the power to rally; the children are born with degenerate constitutions; the will power for good is weakened, and character and happiness destroyed? It is not to be wondered at that, seeing the evils wrought by abuse, the use of alcohol is condemned, and the cry is raised: "Come out of the unclean thing, touch not, taste not, handle not". But the conventual and monastic view is not that of human life. The wise man is he who can enjoy all the good gifts of this world while keeping his body in subjection, his mind pure, and his life undefiled. To acquire property is not to be a thief, to be a husband is not to be a profligate, and to drink wine is not to be a drunkard. "Be ye temperate in all things," is the dictum both of the philosopher and of the prophet.

CHAPTER IV.

STIMULANTS—(*continued*).

The Coca of Peru—Coca Wine.

That all men and women feel the weariness of life is testified by the fact that the people of all nations and all climes have the universal habit of daily seeking a restorative and stimulant in one of the vegetable products which contain a substance or alkaloid capable of exercising a definite effect on the nervous and cardiac systems. Thus, the Chinese and Japanese sip their tea, and the English, following their example, brew the five o'clock cup of the fragrant herb to sustain them in the day's work, the Arab and Turk seek, like the French and Germans, restorative powers in the aromatic coffee berry, the Cingalese chew the betel nut, and the natives of Peru on the slopes of the Andes find in coca leaves a principle which sustains the body in fatigue and comforts the mind in hopelessness. Von Bibra says of coca: "It satisfies the hungry, lends new strength to the weary and fatigued, and makes the unhappy forget his grief". What, then, is this strange substance which seems to conceal a fairy's wand? We shall find, however, that, resembling other fairy wands for the cure of the plagues of life, it may turn, like the magician's rod, into a viper.

Coca is obtained from the leaves of a shrub-like plant called the erythroxylon coca; it is a native of Peru and Bolivia, where it has been cultivated with the greatest care from the remotest antiquity. When Peru was conquered by the Spaniards in the sixteenth century, and the ancient

and interesting people of this country were discovered, it was found that their Incas or kings looked upon the cultivation of the coca plantations as a public and national duty, and also that the strange custom prevailed among the Peruvians of chewing the leaves of the coca plant during frequent and short periods of repose, specially set aside for this purpose. This custom prevails to this day among the half-bred Indians of Peru and Bolivia. Three or four times a day the Indian, labouring in the mines or on the plantations, retires from work, and, lying down in a comfortable position, draws from a leather pouch a few leaves of coca; these he rolls into a ball, which he puts into his mouth and slowly chews, adding from time to time a small amount of unslaked lime, which is said to bring out the true flavour of the leaf. The chewing causes a copious flow of saliva, which is swallowed, but the masticated leaves are rejected when all they contain has been thoroughly extracted. The Indian of the Andes is by nature gloomy, taciturn, and melancholy; but when chewing the coca leaf in repose he seems to be in a condition of passive happiness, and to be removed for a short time from the depressing effects of the toil, the poverty, and the hardship of his lot. The indulgence in coca may be pushed to the extent of intoxication, or the habit of chewing may enslave a man; but these cases are not common among the Indians.

The physical effects of coca are, however, more salutary and in many respects more remarkable than the mental. It is universally acknowledged that coca stills hunger, overcomes drowsiness, and increases bodily activity. All travellers in the Andes bear testimony to the wonderful power shown by the Indians to endure fatigue, cold, wet, and exposure, with only the scantiest allowance of poor food, if they are supplied with coca. The life of the Indian of the Andes is one of extraordinary toil and hardship. His diet consists mainly of a small quantity of maize and frost-dried potatoes; he is constantly exposed to the intense heat of the plains or to the terrible cold of the high

plateaus of the Cordilleras ; the toil exacted of him in the mines and the plantations is excessive ; but he is yet able to perform, not exceptionally, but constantly and as a matter of daily life, the most astonishing feats of endurance on a diet which would be absolute starvation to a European, or to exist even for a time without food at all, by the aid of the power which coca gives. Von Tschudi, the naturalist and traveller, gives a remarkable account of an Indian, sixty-two years of age, who was employed by him in digging for five days and nights, with only an interval of sleep of two hours each night. During this time it is asserted that he never tasted food, though at intervals of from two to three hours he chewed half an ounce of coca leaves. The work done, he accompanied Von Tschudi on foot through a two days' journey of seventy miles across the level heights, halting only to chew his coca. The most striking stories are told of the men engaged in the postal service, who, half-naked, traverse the icy slopes of the Andes carrying the heavy mail bags. These men walk from 200 to 300 miles, crossing the mountain by paths rising 13,000 and 14,000 feet above the sea level ; their scanty clothing being a poor protection against the fierce snowstorms, the intense cold and the rarefied air of the Andes. Their food for the journey consists of from one to two pounds of dried maize and potatoes ; but if supplied with sufficient coca to chew they endure cold, hunger, fatigue, and sleeplessness not only without complaint, but without even seeming to be aware of them. In like manner the Indian labourers in the mines of the Cordilleras, whose toil is spoken of as incessant and excessive, and performed in damp, cold, and darkness ; the shepherds tending their flocks of alpacas on the bleak Pampas, and the farmers irrigating their fields at night in mid-winter on the high plateaus, standing often knee-deep in icy water and exposed to cutting blasts, are all said to be equally inured to a life of surprising hardship and privation, by the daily use of coca. It is stated, however, that though no hermit or monk ever lived so ascetic a life as

these poor Indians, yet the appetite for food is only stayed, not destroyed by coca, and that if any one is kind and generous enough to feed them, they eat with voracity and evident enjoyment. It is also said that if they change their food and give up coca they lose their power of endurance; and, moreover, that the Spaniards who go to work in the mines cannot stand the great hardships of the life and the inclemency of the Cordilleras till they take to the regular use of coca. Von Tschudi tells us that this life of silent endurance and bitter abnegation may be much prolonged, even in one instance to 130 years.

The other remarkable effect of coca is the influence it exercises on the respiratory centres, so that the rarefied air of the higher altitudes of the Andes can be breathed without the distress usually experienced at the height of thirteen or fourteen thousand feet above the sea. All travellers speak of the extraordinary way in which the Indian porters will keep up with the quick pace of the mule along the roughest mountain paths without showing any signs of breathlessness.

Though wonderful but little credited stories were told for two centuries of the staying power of coca leaves, no attempt was made to introduce them into Europe, and scientifically to test their value either as dietetic or therapeutic agents till about forty years ago. The first experiments were nugatory, as the substances which give the leaves their subtle power escaped or were volatilised during the voyage. Care has, however, since been taken to enclose the leaves in air-tight boxes, with the result that a great variety of fluid extracts and wines of coca are now made, and are widely recommended for their tonic properties.

The staying powers of coca.—I have had some small experience of the value of one of these under exceptional circumstances. When reading some years ago in Paris, under pressure of time, for public *vivâ voce* medical examinations I found that I could work for from fourteen to sixteen hours a day, for three or four weeks together (work

ending in successful examinations), without mental or physical fatigue, or bad after-results if I took a small daily dose of coca wine. My modicum was a bottle a week, discontinued immediately my task was done. Recently, when making a long convalescence from influenza, in which depressing cardiac symptoms were marked, I found again in coca a good and reliable restorative. I have no reluctance in saying that, if I had to accomplish some severe work which drew exhaustingly on my full mental and physical powers—such as preparing in a short time for a public scientific examination in a foreign language, doing literary work under pressure, or nursing one dear to me through a serious illness—I would unhesitatingly, and with good conscience, seek the support and power of endurance coca can give.

Mr. Eber Caudwell published an interesting account in the *British Medical Journal* (vol. i., p. 17, 1888) of the effect coca had on himself in enabling him to go through long hours of toil without sleep, and while preserving his full mental activity and vigour. When the pedestrian Weston was performing his feats of walking, it was noticed that he was always chewing a greenish substance, and after repeated inquiries he at length admitted that this was coca, to which he trusted to maintain his muscular activity without fatigue. Singers find that coca enables them to inspire more deeply, and to hold their breath longer than they could otherwise do.

But coca is not without danger; and what to the poor Indian may suffice for food; what may enable the student to give the hours of sleep for study without increasing fatigue; what may yield to the traveller and labourer the power of accomplishment without inducing weariness, may become to the fashionable lady another source of self-indulgence. As a rule, all well-to-do persons are overnourished, and the debility of which they frequently complain is not due to the want of food and stimulants, but to having fatigued and broken down the bodily machine

in its efforts to digest and get rid of the amount of food, wine, and "strengthening substances" taken. The only justification for adding coca to one's daily diet would be an undue amount of labour to be undertaken, or the lessening of the usual amount of food ingested. Coca gives to the Indian the power to endure a life of penurious toil and privation ; in like manner a rigid asceticism should with us accompany the use of coca. The knowledge of its powers cannot fail, however, to be of value to the pedestrian and traveller, and to those who work hard and live low.

Cocaine.—The most valuable substance extracted from coca is cocaine, which from its power of producing local and superficial anæsthesia has been much used of recent years in operations on the eyes, teeth, etc. Cocaine rapidly became a fashionable nerve stimulant and sedative ; but its use has been accompanied with many fatal accidents, and with the introduction of a new disease, namely, a morbid longing for cocaine, or *cocainism*. Thus the fairy's wand, that stayed the hunger of the poor and enduring Indian in the Andes, has become a viper in the bosom of a self-indulgent society. The sale of cocaine to the public, other than as a drug, has been forbidden in France, and will probably also be rendered illegal in America.

The scientific study of cocaine has led to a better comprehension of the mysterious qualities of the coca leaf. The first effect is sedative, rapidly followed by stimulation, in which the heart beats are quickened, the nervous system becomes more active, the intelligence more acute, and the muscles pass more easily into a state of contraction. Dr. Mantegazza says that when he was under the influence of coca he had an irresistible inclination to gymnastic exercise. The absence of the sense of hunger seems to be due not only to the anæsthetic effect of the cocaine on the nerve ends of the stomach, but also to the fact that coca is an actual economiser of food, and so modifies the vital processes in muscle as to affect its chemical activity, and to render it capable of performing an equal and greater amount of work

with a lesser consumption of carbo-hydrates (Stockman). The absence of emaciation, subsequent debility or other bad results after the most exalted powers of the organism have been called forth, point to coca being more than a nerve stimulant, and also an actual economiser of the bodily expenditure. If it diminishes the consumption of carbo-hydrates during muscular activity, that is to say, if it enables the machine to work with less fuel, less oxygen will be required, and hence is explained the effect of coca in preventing breathlessness during the ascent of high mountains. Excessive quantities of coca cause headache, giddiness, mental aberration, and ultimately nervous breakdown.

CHAPTER V.

RESTORATIVES.

Tea.

THE restorative properties of tea are well known and universally admitted. To partake of "the cup that cheers but not inebriates" has become a national habit, and is indulged in equally by the richest and the poorest.

How tea is prepared.—Tea consists of the prepared leaves of a small shrub-like plant resembling a camella. It is cultivated in China, Japan, India, and Ceylon. The leaves are gathered by hand three times in the year, the young and tender shoots making the finest teas. The peculiar astringent quality and aromatic flavour of tea, as we know it, are developed in the processes of drying and roasting. Green tea is prepared from the young leaves, which almost immediately after being gathered are cast into shallow pans and roasted over a brisk wood fire. After being thus treated for about five minutes, they are removed, thrown upon a table, and rolled with the hands. They are again thrown into the pan, and are well shaken about over the fire for an hour and a half, till they are thoroughly dried, when the pale green colour characteristic of green tea is fixed. These slightly roasted and delicate green teas are highly appreciated by the Chinese, the Japanese, and the Russians; but are scarcely used in England except by tea connoisseurs. Many of the teas known in England as "green teas" are not of this fine variety, but are the coarser teas faced or coloured with Prussian blue or indigo. These are, however, little used now. In

the preparation of black tea, the leaves after being plucked and brought in from the plantation are allowed to lie in heaps for about twelve hours. They are then tossed into the air, and patted with the hand by the workmen until they are soft and flaccid ; again thrown into heaps, and allowed to remain for some time. They are then rolled into balls, and the sap is squeezed out by the hands of the workmen, the leaves receiving at the same time a twist. They are then roasted and rolled, in the same way as green tea. After this they are laid on sieves, and exposed out of doors for three hours to a sunny air. The leaves are again roasted and rolled a second time, and this process is repeated, with slight alterations, three, four, and even five times. The tea leaves are now perfectly dry, of a fine black colour, crisply rolled, and assume the appearance we know so well. There is no doubt that fermentative changes take place in the preparation of black tea, which considerably alter the chemical character of the leaf.

The constituents of tea. — Tea contains three active principles to which it owes its peculiar properties and characteristics. These are *theine*, a crystallisable alkaloid, to which is due its stimulating and restorative properties : *tannin*, whence it derives its astringency and a good deal of what is popularly known as " strength " ; and a *volatile oil*, to which it owes its aroma. There is probably also a bitter principle, which has not yet been separated ; it is less soluble than tannin, and is extracted from the leaves and passes into the water after a long infusion or stewing. Both theine and tannin are soluble in boiling water. The theine is in combination with tannic acid, and the theine and tannin are together dissolved out of the leaves into the water. There is a popular impression that by a very short infusion of only two or three minutes, theine can be obtained from tea, without the tannin. This is a mistake. Tannin, which is very soluble, is always dissolved out with the theine. Some teas, however, continue to give off tannin after the chief part of the theine has been dissolved

out. These are chiefly the Indian teas, which have been highly fired and much fermented in the process of preparation.

The following table, taken from a number of analyses recently made by the late Professor Dittmar, shows clearly the effect of allowing the water to stand on the tea leaves five minutes and ten minutes respectively, and the varying amount of theine and tannin given off by China, Ceylon, and Indian teas :—

	Five Minutes' Infusion.		Ten Minutes' Infusion.	
	Theine.	Tannin.	Theine.	Tannin.
China .	2·58	3·06	2·79	3·78
Ceylon	3·15	5·87	3·29	7·30
Indian	3·63	6·77	3·73	8·09

From this it will be seen that though Indian tea contains 25 per cent. more theine than China tea, it also contains 100 per cent. more tannin. Indian teas are much more widely used in England than China teas, and the "strong syrupy teas," advertised as of good value, and so largely consumed by the working classes, are, as a rule, blends of various Indian teas rich in tannin and astringent matters. It thus obviously becomes a matter of great, and even of national importance, considering how extensively and continuously tea is drunk, to ascertain the physiological effects of its principal constituents—theine and tannin.

The physiological effects of tea.—Universal experience teaches us that tea exhilarates without intoxicating, stimulates the circulation, excites the brain to increased activity, promotes wakefulness, and banishes the sense of weariness. It also deadens the sensation of hunger, and increases the power of fasting. It will cool the body when hot, and warm it when cold. In tropical countries it has been found to be a most valuable restorative when taken by soldiers on long and fatiguing marches. Lord Wolseley, who is a great advocate for tea as a beverage on which to do hard work

gave orders that the water-bottles of the soldiers whom he led on the two famous and exhausting expeditions of the Red River, and up the Nile to Khartoum, should be filled with cold tea; and he is convinced that, whereas alcohol induces fatigue, tea will give the power to endure and overcome it.

The exhilarating and the staying powers of tea are due respectively to the theine and tannin it contains; the theine exhilarates the nervous system, the tannin stays hunger. This latter point has been made clear by the interesting and valuable experiments of Sir William Roberts, who has shown that tannin, taken even in very small quantities, has an inhibitory or slowing influence on the digestion of food in the stomach. He found that this took place with tea made at the ordinary strength, and taken in the usual amount, with food; the digestion being still longer delayed if a large amount of fluid tea was drunk. He could not, however, detect any appreciable difference between the inhibitory effect of tea infused for two or three minutes and tea infused for fifteen or thirty minutes. In fact, the tannin, always and inevitably present in tea, is sufficient to retard digestion; and the amount of tannin taken, and the increased retarding effect produced, depend not upon the length of time the tea is infused, but upon the total quantity of fluid tea drunk. This inhibitory or retarding influence of tea on digestion Sir William Roberts considers to be useful and salutary. Slow digestion does not mean imperfect digestion; and it would appear that the tannin by slowing digestion, and the theine by exhilarating the nervous system, give to tea the extraordinary power of inducing the endurance of fatigue and fasting, of which we all have daily experience, and which makes tea so favourite a beverage with the poor. The afternoon cup of tea, taken with a small amount of bread and butter, will enable a great many hard workers to dispense with luncheon, and to remain without food till a late dinner-hour, without experiencing any discomfort. The inhibitory or slowing

influence of tannin is more marked on starch than on albuminates; hence the satisfying character of a good meal of tea and bread, and the probable cause of indigestion and nightmares consequent on a "high tea" with cold pie and cakes. A pinch of bicarbonate of soda put into the teapot will destroy the deterrent effect of tea on stomach digestion (Roberts).

Tea has its dangers, and these are well known to doctors. If taken in excess, it may produce cardiac disturbances, palpitations, flutterings, a nervous impression of distress and anxiety, and even intermittence of the pulse and sleeplessness, while sometimes it provokes an obstinate form of gastric catarrh. It is said that these effects are due to the tannin contained in the tea, but this assertion is by no means proved. Tannin has but a slight effect on peptic action, and the slowing effect of tea upon stomach digestion is not fully explained by the presence of tannin in tea (Roberts). The assertion one hears made that the tannin of tea tans the coats of the stomach into leather is one of those statements which are based more upon a lively imagination than on the data of science. The coats of the stomach do not in any way resemble a hide. They are, moreover, not dead membrane, but living tissue, and the effect of tea on meat fibre is not to harden it, but to cause it to swell. If tea is found to disagree with a person either by over-stimulating the nervous system, or by delaying digestion, the remedy is to take it in smaller quantities or extremely weak, and also not with but after food. In some forms of dyspepsia, particularly in the hysterical flatulent form, tea should, at all events for a time, be entirely abstained from.

How to make good tea.—The evil effects of tea have been attributed to the methods in vogue of making it. We have seen that the soluble theine is at once dissolved in the hot water, but that the tannin contained in the coarser teas generally used in England continues to be given off if the tea is left standing on the leaves. Now, this is what

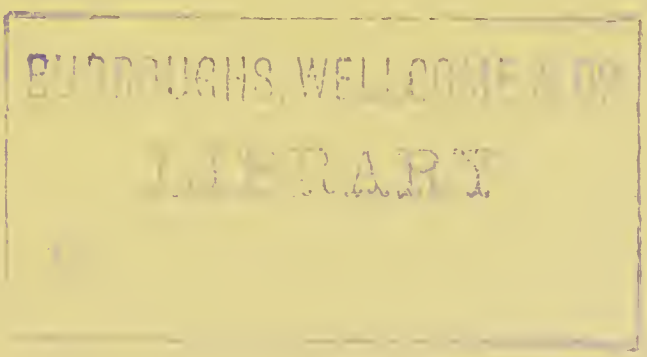
almost invariably happens ; and the last cup of tea drawn from a pot long standing, and which is said to be "very strong," is strong, not so much in the restorative principle of the theine, but in the astringent tannin which inhibits or slows digestion, and also in the bitter principle which is finally extracted from the leaves. To the habit, customary among the poor, of slowly stewing the tea on the hob, and also to the practice at restaurants and railway stations of continuously boiling it in urns, much of the dyspepsia attributed to tea-drinking is probably due. The reason is, however, not clear. The professional tea-taster allows the boiling water to stand on the tea leaves five minutes and no more ; the infusion is then poured off and drunk. If this custom were universally followed we should probably hear fewer complaints about the evil effects of tea-drinking. In order to prevent the tea standing on the tea leaves, various teapots have been invented, by means of which infusion for a certain definite time can be obtained, and the tea leaves are then withdrawn. The best and simplest method is, in my opinion, to have a fine wire basket, in which the measured amount of tea leaves is placed ; it is then closed and dropped into the hot water in the teapot for five minutes, after which it is withdrawn. Another method is to have a china strainer under the lid of the tea-pot, in which the tea leaves are deposited, and the boiling water is poured through the strainer. These teapots are made in Japan, and are imported in large quantities into this country. I have also seen used in Germany a concave perforated metal measure, which is placed at the top of the cup ; this is then filled with hot water. When the leaves are sufficiently infused the measure is withdrawn, and the tea leaves are thrown away.

National customs in tea drinking.—In England tea is drunk with sugar and milk. Some contend that this custom has been introduced owing to the fact that we drink coarse tea, so strong in tannin that it is necessary to add sugar and milk to mitigate the astringent flavour. This may be

so; but the addition of sugar and milk makes the cup of tea a nourishing food, whereas alone it would only be a stimulant. In Russia, tea is drunk without sugar and milk, but with a slice of lemon added; but there, the finest and most costly teas are chiefly used. In China and Japan—the home of the tea plant—the drinking of a cup of tea is the invariable accompaniment of all ceremonies. No visit can be paid, no bargain can be struck, no contract can be made, no meal can be taken without a cup of tea. If one is engaged, as is the lot of every traveller, in paying numerous visits both of business and pleasure during the day, it is surprising the number of cups of tea one can consume; and yet tea-dyspepsia and tea-nervousness are unknown in Japan. The cause may be due to the fact that Japanese teas are only slightly roasted and fermented, and that the method of making tea adopted leads to less tannin being dissolved out than by the English method. Every Japanese household, however poor, possesses a large metal tea kettle and a small porcelain or pottery teapot. Into the tiny teapot is placed a small amount of fine green tea. On this is poured water not quite boiling. Without allowing the water to stand on the leaves more than a moment or two, the tea is poured into small porcelain cups, and drunk pure, without any admixture. Tea taken in this way is extraordinarily refreshing. When in Japan, I have sometimes, after being engaged in the fatiguing, incessant, but fascinating occupation of shopping, turned to the saleswoman serving me, and said, *O cha dozo Oka san*, which means, "Please give me a cup of your honourable tea, good lady," at which request the tiny teapot has been immediately produced with many smiles and bows, and has yielded an astonishing number of small cups, water being continually added from the pretty chased iron kettle. After this "restoration" shopping again became fascinating.

The tea ceremony in Japan.—There is another kind of tea which is also drunk in Japan on the occasion of the unique and solemn Tea Ceremony. This ceremony, which

has become a national and tenaciously-held custom, was invented by a great chieftain called Hideyoshi, in the early part of the sixteenth century, with the object of teaching his turbulent barons to be courteous, self-controlled, and silent. At the Tea Ceremony, the details of which are long, elaborate, and definitely arranged, a fine green tea, which has been ground into powder, is brewed in a regulated and ceremonious manner by an official of the household, called the cha-nou. The tea powder is stirred with a whisk in hot water in an antique bowl. This bowl of tea is handed round to the guests seated on their heels on the matting, and is drunk, tea-dust and all, in solemn silence, the bowl being returned to the cha-nou with forehead bowed to the ground. Thus in this, as in many other things, Japan takes the opposite view to England ; but we may, I think, learn from Japan to our advantage, and the cup of tea, which in England is notoriously the signal for scandal, is in Japan the opportunity for a meeting of friends in silence.



CHAPTER VI.

RESTORATIVES—(*continued*).

Coffee—Cocoa—Chocolate.

Coffee is a valuable restorative.—Though coffee closely resembles tea in constitution, it has its own special characteristics and properties. From time immemorial it has been known and valued in Arabia, the native home of the coffee plant; and the finest coffee still comes from Mocha. The Moors and Arabs of the Orient, who are forbidden by their religion to take alcohol, find in coffee a stimulating beverage. The first coffee-house was opened in London in 1652, and since that date the use of coffee has constantly increased, though owing, in a great measure, to the imperfect way in which it is made in England, it is not nearly so favourite a beverage here as in France.

The coffee plant and coffee berry.—Coffee is the seed of the fruit of the coffee tree, a shrub-like plant which is cultivated with the greatest success in Arabia, Turkey, the West Indies, and Java. The only preparation the berries undergo is that of roasting, during which their peculiar aroma, taste, and flavour are brought out.

The constituents of coffee.—Coffee, like tea, contains three active principles. These are the alkaloid caffeine, which is identical with, and has the same properties as theine; secondly, an astringent substance resembling tannin is present in much smaller quantities than in tea; and thirdly, a volatile oil developed in roasting, which gives the coffee its aromatic odour. Coffee, like tea, also contains a considerable amount of gluten, which is only slightly soluble in water.

The following approximate analysis will show the differences between tea and coffee :—

	Tea.	Coffee.
Water	5	12
Tannic acid	15	5
Theine or caffeine . . .	0·50	0·75
Gluten	25	13
Fat and volatile oil . .	4	13
Woody fibre, gum, etc. . .	50·50	56·25
	100·0	100·0

From this table it will be seen how closely tea and coffee resemble one another. Tea is, however, the more astringent drink, and coffee the more stimulating and aromatic. In Europe, the ground coffee berry is generally simply infused, when its theine, tannic acid, and volatile oil are dissolved into the water. Among some of the Eastern nations the custom prevails of pounding the coffee in a mortar till a fine powder is produced. The coffee grounds are left in the cup, and are swallowed with the coffee. In this way the gluten and nutritive properties of the coffee berry are consumed, and thus a cup of coffee becomes a nutritious food.

The physiological effects of coffee.— Coffee has been called in France "an intellectual drink," owing to the fact that it has a decided stimulating influence on the nervous centres, lessening the need for sleep, and increasing the capacity for mental work. It also seems to have, like coca erythroxylon, the power of augmenting the functional activity of the muscles, even while it diminishes tissue waste. Like tea, coffee lessens the sense of hunger, and will banish fatigue. To the soldier on the march it has proved the most valuable restorative, and for the explorer in the Arctic regions a cup of warm coffee has been declared to be a far better nightcap than rum and water.

As to the power of coffee to sustain under fatigue, cold, and exposure, I may, perhaps, be allowed to give a

personal illustration. Some years ago a party of travellers, including myself, started from Leukabad with the intention of climbing the Gemmi and crossing a pass involving a toilsome mountain walk of not less than thirty miles. The Gemmi is a solid wall of granite, which rises steeply to the height of 5000 feet. So precipitous is this immense cliff that travellers are only allowed to mount it on foot by means of the narrow paths which are cut in zig-zags along its bare surface. We had not proceeded far on our journey when we were overtaken by a severe snowstorm. Unwilling to turn back, and enjoying the beauty of the storm, we steadily climbed to the summit of the Gemmi. Here, however, we met the full force of the storm, which was sweeping unchecked over the glacier-worn surface of the snow-covered plain. In the teeth of the wind and the blinding snow we pressed forward mile after mile, while the icicles hung from the beards of the gentlemen and the hats of the ladies. Presently we came in sight of the lonely hospice which stands beside the black waters of a tarn. Glad of shelter we turned into the little inn and shook the snow and icicles from our clothes, and changed wet stockings and boots for dry ones, always carried with us as a precaution. "What shall we take?" was then the question, and various stimulants and hot drinks were suggested; but my husband, knowing that we did not wish to stay the afternoon and evening at the dreary inn, advised us not to touch alcohol, but to take only hot coffee if we wished to continue our journey. To the disappointment of the innkeeper, we therefore ordered nothing more than a large pot of smoking hot coffee, with which we refreshed ourselves. After a short rest, stimulated and warmed by the coffee, we again started gaily on our journey, and walked another sixteen miles through the snow-covered forests to the nearest green valley, which we reached late. We were all convinced that it was owing to the coffee that we accomplished this toilsome journey in the snowstorm on foot, and that if we had taken alcohol as a restorative we should have spent the

afternoon tired and chilly by the inn fire. This view is strongly expressed by Germain Sée, the French physician. In comparing alcohol and coffee, he says: "The muscular system and muscular energy are marvellously roused by coffee, and a man fatigued or overworked can find no more wholesome support; whereas alcohol produces in the muscles a dubious passing excitement, and in the end a degeneration of all the organs of human activity." Sir William Roberts says that coffee inhibits or slows stomach digestion, which action is very marked in strong black coffee, hence it is unadvisable for those who have weak digestions to take strong coffee after dinner.

How to make good coffee.—Coffee is not sufficiently appreciated in this country. This is due in a great measure to the imperfect way in which it is made. Coffee should be purchased in small quantities fresh roasted, should be ground just before it is used, and should be taken perfectly pure without any admixture of chicory. Coffee can be made either in a percolator, in which an infusion is made by slowly pouring boiling water through the ground coffee, or it may be boiled in an enamelled saucepan and then strained; or it may be prepared in any of the patent machines which boil the coffee for a limited time only. In my opinion the full flavour of the coffee is only extracted by boiling, but the time of boiling must be very short, not exceeding a minute. Dr. Burney Yeo suggests that the coffee grounds left in the bag of the percolator should be boiled in water, and that this water should be used to percolate the next day's coffee with. In the French army coffee is made in a machine in which the water is passed in small jets several times through the ground coffee. Good coffee cannot, however, be made without a sufficient quantity of ground coffee; not less than 2 oz. to a pint of water should be used.

The small popularity coffee has in England is due to the fact that it is largely adulterated with chicory, and also that it is made so weak that its stimulative, refreshing, and

aromatic qualities are not enjoyed. Coffee can be drunk much more continuously than tea without inducing bad consequences, though in some people strong coffee produces palpitation of the heart.

Chicory is the roasted and ground root of the wild endive. It contains a volatile oil and a bitter principle, but no caffeine. It is added to coffee to increase the flavour, and to give the appearance of strength. It readily stains water, so that its presence can at once be detected by putting a pinch of what has been purchased as ground coffee in a cup of cold water; if pure the water remains clear, if chicory is present the water will be stained.

Cocoa.—Cocoa is derived from the seed of a plant called the *theobroma cacao*. The name was given by the botanist Linnæus, who expressed his high opinion of cocoa by the name "theobroma," which means "food for the gods". The seeds are embedded in a pulpy fruit; when ripe they are separated, sun-dried, and roasted. Cocoa nibs consist of the crushed kernels of these seeds; but cocoa such as we generally use has undergone a long and elaborate process of preparation. The following analysis (Payen) of cocoa will show in what way it differs from tea and coffee:—

Cacao butter	50
Albumen, fibrin, etc.	20
Theobroma	2
Starch	10
Cellulose	2
Mineral matter	4
Water	12
	100

It is thus seen that cocoa is rich in fat, that tannin is absent, and that it contains an alkaloid, theobromine. This alkaloid is almost identical with theine and caffeine, and has probably the same stimulating and inhibitory action; but as it is present in diluted cocoa in very small amount, cocoa is a less stimulating drink than tea and coffee. Its

constitution shows, however, that it is highly nourishing. In the various prepared cocoas, the excess of fat has been extracted, and sugar, and sometimes starch, added. There are three ways of making cocoa according to the mode in which the cocoa has been prepared. *Stewing:* The cocoa nibs are slowly boiled or stewed for several hours, and the subnatant fluid is poured off. A more stimulating, but less nourishing, drink is thus obtained than from prepared cocoas. *Infusing:* In cocoas prepared without the admixture of starch, such as Van Houten's and Schweitze's, it is necessary only to mix a certain amount with hot water to make a soluble infusion. These cocoas are particularly suitable to those persons who must avoid starch in their diet. *Boiling:* Most of the prepared cocoas contain a large amount of added starch ; it is therefore necessary to boil them before drinking. They form a highly nutritious and fattening food, especially when taken, as is usual, with milk.

Chocolate is prepared from cacao seeds by grinding, and by the addition of a large amount of sugar and various flavouring matters. It forms a luxurious and highly nutritious food, and is very rich in all the necessary constituents of diet, *viz.*, hydro-carbons, carbo-hydrates, and albuminates. A small amount of solid chocolate will be found a valuable preventive against hunger when circumstances oblige one to go long without food. I have frequently found that a penny slot of chocolate at a railway station will enable me, after being eight or nine hours without food, to continue my avocations without being tormented with the sense of hunger.

CHAPTER VII.

WATER—SALTS.

Water.—When it is remembered that water forms from 60 to 70 per cent. of the body, and that it enters into the composition of every living tissue, it can be readily understood how important an article of diet it is. In all the processes of metabolism or constant change, by which alone life and function are maintained, water plays a part. Thus, in digestion, the food principle must be dissolved before assimilation can take place; in respiration the expired air is charged with moisture; in circulation the blood must be fluid; in the secretions, by means of which the body machine is maintained in working order, and in the excretions by means of which the refuse is cast out, the presence of water is an absolute necessity.

To drink pure water is the custom of the natural man; to drink impure water is the almost invariable habit of the civilised man. In the days of the Greeks, the Romans, the Egyptians, and the powerful and interesting races of India and Asia Minor, the provision of pure water for the people was looked upon as a national obligation; and the ruins of the great aqueducts, by means of which the water of mountain and sky and lake was carried immense distances to the cities, to-day cumber the ground whence the people now draw their water supply from polluted wells. It is only of recent years, and not till the ravages of cholera and typhoid had at last taught the people and municipal authorities the lessons which the sanitarians had never ceased to preach in season and out of season, that the

absolute necessity of a perfectly pure water supply for drinking purposes has been recognised.

In London the water supply is derived from the Thames, the Lea, and the New River, rivers which receive sewage and filth of every description along almost the whole length of their course. Elaborate and costly precautions are, however, taken by the water companies to get rid of all the unwholesome and dirty particles with which the water is more or less charged. This is done by means of filtration and by the formation of large filter beds. Nature's way of cleansing polluted water is twofold—either to pass it through immense filter beds of gravel, beneath which it collects in underground reservoirs, which may be naturally tapped by "faults" in the strata, leading to the formation of springs of pure water, or by shafts purposely sunk; or foul water is purified by means of the flow of a river, during which the solid particles sink to the bottom, and the organic pollutions, such as germs, etc., are oxidised and destroyed. Spring or well water often contains inorganic materials, dissolved out of the soil through which it has passed, such as lime, iron, etc. River or stream water is the pleasantest to drink, as it contains much air, and a small proportion of organic salts, which give it an agreeable flavour. So long, however, as it is not considered a crime against humanity and the State to pollute a river or stream, unfiltered river water is dangerous to drink.

Water is purified in three ways: by filtration, by distillation, and by boiling.

Filtration.—A great variety of filters have been invented. The principle is the same in most of them; namely, to pass the water through some finely granular material, such as gravel, manganic iron, or charcoal, with the intention of arresting the passage of suspended particles. None of these filters which are in ordinary use give complete security; and in order that they should give even comparative and temporarily good results, it is necessary that the filtering material be frequently renewed. It is

now known that to confer safety, water should be bacteriologically pure, and free from the bacilli of disease. The only type of filter known that fulfils these conditions is the Pasteur-Chamberland model, and partially some of its imitations. In this filter the water is made to pass through a solid cylinder of porcelain base, specially tested to produce complete sterilisation of the water. This filter is now used extensively in laboratories and wherever it is important that water should be entirely free from dangerous organisms.

Boiling.—Water is rendered quite harmless by boiling. In cases where it is not possible to have a pure water supply, where the water can only be obtained from a polluted river or well, cases which are common enough in the country districts in England, and almost invariable abroad, it is more than advisable, it is necessary, for the preservation of health, to boil all the water used for drinking purposes. A most useful, and, in fact, an indispensable addition to the traveller's luggage when going abroad is a little Etna and a spirit lamp. The purchase of a few lemons will then enable the traveller to make a refreshing and inexpensive beverage with water taken from the bedroom carafe and thoroughly boiled. If he follows this simple plan of drinking fresh lemonade made with well boiled water, he will escape the risk of imbibing the germs of typhoid fever or cholera. **Boil your water** is the sum and end of all the teachings of the bacteriologists and sanitarians as a protection against typhoid and cholera and infectious diseases carried by water.

The amount of water daily required to be taken varies considerably with the individual, some persons losing more by perspiration and the kidneys than others. From 2½ to 4 pints a day is the usual quantity required, and with most persons much of this is taken in the form of tea, coffee, or beer. A draught of fluid is useful after dinner to wash any undigested particles out of the stomach.

The organic salts.—The universal custom of eating

common salt with food testifies to a need of the body for this particular material. Such, indeed, is the fact. Chloride of sodium, or common salt, is found in all the tissues and fluids of the body. Without it the blood could not maintain its fluidity, nor could fluids pass through animal membranes. When it is remembered that it is only by the passage of fluids through the membranes of the blood vessels and the lacteals that the products of digestion can be absorbed, it will be seen how important it is to take salt with our food ; in fact, if we were entirely deprived of common salt, we should soon die. In parts of Central Africa, where no salt is imported, and the local supply is small, salt is so highly prized that it is a valuable article for barter, taking the place of money. The salts of sodium potassium and magnesium are contained in small quantities in the animal and vegetable foods we take, and are important for the maintenance of the body in health. The salt which is, however, present in the largest amount in the body is lime, in the form of phosphate of calcium, which constitutes one-half of our bones. As the bones when once completely formed, at the age of about twenty-five, do not change in form, the presence of lime in the food is not of so much importance in adult life as in youth ; in fact, it becomes often rather important to exclude it, for drinking water highly charged with lime salts may give rise to concretions and deposits in the kidneys and bladder. In such water the lime can be precipitated by boiling.

Fruit salts.—There are a whole class of salts called lactates, tartrates, citrates, malates, and acetates, which are present chiefly in fruits and vegetables. These are converted into carbonates in the body, and they contribute to keep the fluids of the body alkaline, which is necessary so that the functional activity of the body may be carried on. If these salts are not provided in the food, the body is ill nourished, and finally that condition of mal-nutrition known as scurvy is produced. Though green vegetables have small nutritive value, they always form part of the diet,

owing to the fact that they furnish the body with the necessary fruit salts. The experience of sailors and Arctic explorers has taught us, often by the severe lesson of terrible suffering, that it is far better to do without the rum ration than without the preserved vegetables, which contain the fruit salts required.

Condiments, such as pepper, spices, and vinegar, give a flavour to food, and perhaps aid digestion by stimulating appetite.

CHAPTER VIII.

UNDER-FEEDING AND OVER-EATING.

THANKS to the careful and lengthened studies and the recorded observations of physicians and sanitarians, more especially of prison and army doctors, there is no subject in physiology on which we possess such accurate information as the amount and kind of food to be taken in proportion to the amount of work to be done. If the body be closely watched it will be found that it responds in its capacity for work to its food supply, as accurately and delicately as does the steam engine to its fuel supply. Without fuel, and the proper supply of fuel, force cannot be got from the engine, and without food and its proper supply in amount and quality, work cannot be got from the human creature. A person may indeed subsist on very low diet, or even exist in a quiescent state for some time without food at all, if supplied with water; but a life of health and vigour can only be maintained on the condition that the body is properly fed and nourished. To ascertain what is the proper amount of nourishment is my object.

Subsistence diet.—We learn from studying prison dietaries, the feeding of famine-stricken populations, and the diet of our own poor in London, what is the smallest amount of food on which the body can live, but not do hard work. This is three pounds of meat, with a pound of fat on it, or the same quantity of butter or lard, two quartern loaves, and about an ounce of salt per week. For meat, if unattainable, can be substituted two extra quartern loaves, or about a stone and a half of potatoes, or between 5 lbs. and

6 lbs. of oatmeal. Thus, we see that a person can actually exist on four quartern loaves and a pound of butter or lard a week without being gradually starved. This is, however, the diet of bare existence; on it a person can do no work bodily or mental, or he will certainly break down. Children, it must be remembered, in whom tissue change is rapid and growth is taking place, require more than a subsistence diet.

A working diet.—Work may be divided into three degrees: 1. Moderate, which may be represented by a daily walk of from five to seven miles. Such is the amount of work done by soldiers on home service, by clerks, or ordinary persons in easy circumstances. For this, judging from army dietaries, 5 lbs. of meat and 7 lbs. of bread weekly, with the addition of vegetables and milk, are sufficient. 2. Active work, such as is accomplished by soldiers on campaign, letter-carriers, and artisans, and which may be represented by a walk of twenty miles. This requires a fifth more nitrogenous food and added starchy and fatty foods. 3. Hard work means the work got through by navvies, miners, etc. As a rule these men eat increased quantities of meat if they can afford to do so. Science teaches, however, that in this they err; and that the force for hard work can be got at much less expense to the purse, and more easily by the body, from certain vegetables and from starchy and fatty foods than from large quantities of meat. An exclusively meat diet is wasteful as well as costly.

How the poor live.—Now let us consider these dietaries and bald statements of fact in the light of experience, and learn something of how the poor live. In a thoughtful article by Mrs. S. A. Barnett (which was published first in the *National Review* for July, 1886, and republished in a book entitled *Practicable Socialism*, a series of papers by herself and her husband), the application of correct scientific principles of diet to the needs and possibilities of the poor is considered. The article should be carefully studied by all who feel themselves called upon to decide social

questions, either theoretically or practically. Very much has been written about dietaries, and the amount of food necessary to raise so many foot-tons; in other words, to enable a navvy or docker to do his daily tasks; but no one, except Mrs. Barnett, has, so far as I know, taken the trouble to turn the percentages and quantities of carbonaceous and nitrogenous food required to maintain health, into economical dishes of potatoes and meat for a family of a working man and his wife and eight children, and to show us the cost of living to a farthing.

Assuming that, on the lowest estimates, a working man requires 16 oz. of carbonaceous and 4 oz. of nitrogenous food a day; his wife, 12 oz. of carbonaceous and 3 oz. of nitrogenous food; and his eight children an average of 8 oz. of carbonaceous and 2 oz. of nitrogenous food a day each; the total indicates that 92 oz. of carbonaceous and 23 oz. of nitrogenous food have to be daily provided. To show how this can be done with all the advantages of scientific culinary knowledge, Mrs. Barnett gives the following daily *ménus*, which I make no excuse for quoting at length:—

Quantity of Food.	Cost.	Carbonaceous.	Nitrogenous.
BREAKFAST—OATMEAL PORRIDGE:	s. d.	oz.	oz.
1¼ lb. of oatmeal	0 2½	14	3
1½ pint tinned milk	0 1½	2¼	1
½ lb. treacle	0 1½	7	—
DINNER—IRISH STEW:			
1¼ lb. meat	0 8	3½	3½
4 lb. potatoes	0 2½	14	2
1¼ lb. onions	0 1	5½	1¼
A few carrots	0 1	¼	—
½ lb. rice	0 1	7	½
1½ lb. bread	0 2¼	13½	2¼
TEA—BREAD AND COFFEE:			
2½ lb. bread	0 3¾	22½	3¾
2½ oz. coffee	0 2½	¼	¼
1½ pint tinned milk	0 1½	2¼	1
Total	2 5	92	18½

Here there is a short allowance of nitrogenous food, which would be corrected by a rather larger allowance of bread. I will give another of these thoughtful daily *ménus* :—

Quantity of Food.	Cost.	Carbonaceous.	Nitrogenous.
BREAKFAST—BREAD AND COCOA:	s. d.	oz.	oz.
2½ lb. of bread	0 3¾	22½	3¾
1½ oz. cocoa	0 1½	¾	¼
1 pint tinned milk	0 1	1¼	½
2 oz. sugar	0 ½	1½	—
DINNER—LENTIL SOUP, TOASTED CHEESE:			
1½ lb. lentils	0 3	15	6
1 lb. cheese	0 8	4½	5½
1½ lb. bread	0 2¼	13½	2¼
TEA—RICE PUDDING AND BREAD:			
¾ lb. rice	0 1½	10½	¾
1½ pint tinned milk	0 1½	2¼	1
2 oz. sugar	0 ¼	1½	—
1½ lb. bread	0 2¼	13½	2¼
Total	2 1¼	86½	22¼

It will be noted that the family is strictly teetotal, and that no extras of any kind can be allowed.

Wages and starvation.—Now, it is apparent that on the lowest estimate and with all possible care and knowledge the daily necessary food of a working man, his wife, and eight children, cannot cost less than on an average 2s. 4d. a day, or 16s. 8d. a week. If he is in receipt of a regular wage of £1 a week, this leaves 3s. 4d. for rent, firing, clothing, and school fees. "It is not to be done!" exclaims the impatient student. But it is done, and done by hundreds of thousands, and happy is the family who can depend upon a regular wage of £1 a week. How is it done, however? By starving. In Mrs. Barnett's pathetic words, "The children have to put up with less than they need; the mother goes without rather than let the children suffer, and thus the new baby is born weakly and half

nourished; the children develop greediness in their never-satisfied and but partly-fed frames; and the father, too often insufficiently sustained, seeks alcohol, which, anyhow, seems to pick him up and hold him together; though his teetotal mates assure him it is only a delusion." Mrs. Barnett sums up the whole matter in these words, "While wages are at the present rate, the large mass of our people cannot get enough food to maintain them in robust health." The results are scrofula, consumption, skin diseases, the exhausting diseases of the bones from which the children of the poor suffer, and the want of power to recover from acute diseases; it is the poor and ill-fed that the epidemics of cholera and influenza sweep to their graves—a stunted and physically degenerate population.

The moral and mental results are that ill-nourished brains are incapable of sustained intellectual effort, or even of correct and consecutive thinking; and hence that degenerate morality and low cunning take the place of a robust conscience and trained intelligence; and it is partly thus that the "criminal classes" of our latter-day civilisation are produced. Mrs. Barnett, with her intimate knowledge of the lives of the poor of London, among whom she has lived for the past twenty-three years, also shows how, in the desperate struggle to obtain even an insufficient supply of food, no funds are left the working man with which to provide books, the means of culture, and the opportunities of social intercourse, all of which are as necessary for his mental health and development as food and drink are for his bodily welfare. Nothing is left, moreover, wherewith to purchase rest and peace by the seaside or in the country, and nothing to meet the severe tax of sickness or convalescence.

How this state of things is to be cured taxes the mind of the philanthropist, the economist, and the socialist; that it is intolerable there is no doubt. We have long been accustomed to boast of our wealth, and to be proud of our national resources; but the squandering of the rich, which

is apparent to all, blinds our eyes to the wants of the poor, which are hidden. We forget, moreover, in calculating the national wealth, that the prosperity of a nation must not be estimated by the spending power of the rich, but by the purchasing power of the poor, and that as long as half our population cannot by any possible means obtain enough food with which to maintain health, disease, suffering, crime, and unrest will be the result.

CHAPTER IX.

UNDER-FEEDING AND OVER-EATING—(*continued*).

Food in Youth and Middle Age.

THE story is told of a great lady, who had been the wife in succession to three husbands, all of whom had been devoted to her—for she was a woman of unusual intelligence, beauty, and character—that she was once asked how it was that men so different in disposition as her three distinguished husbands had been so greatly attached to her, and by what secret charm she had chained their minds and their hearts. The great lady replied simply, "I fed them well." But it is said that the lady outlived all but her third husband, and the question which this story suggests is: "Are the well-fed the long-lived?" This involves another question: "What is the proper amount of food to take at different periods of life?"

In youth food should be abundant.—At this time the body is not only growing, but tissue change or metabolism is active, leading to vigorous life. The youthful body is, if healthy, intensely and restlessly active, and energy is redundant. Watch a family of children out walking with their governess or nurse; notice how they run, skip, and trundle their hoops, how they shout and laugh; how they are filled to overflowing with the vigour and energy of life. This energy and the necessary growth of the body cannot be maintained without an abundant food supply. The food must also contain all the essential elements—albuminates to build up the muscular and other tissues, fats and starches to develop heat and energy, and mineral salts to aid in the healthy formation of bones and teeth.

The diet may be as simple and wholesome as possible, the simpler the more wholesome; but there should be enough to eat to satisfy hunger. The greedy child is, as a rule, the ill-fed child; ill-fed in not having enough to eat, or in having food inappropriate to its age; for the modern custom of allowing children to partake of highly-flavoured dishes with their elders is as much to be deprecated as the starvation system which was in vogue at Dotheboys Hall. Meat, soups, milk, bread, butter, porridge, eggs, fruit, potatoes, green vegetables, farinaceous and sweet puddings, should be the staple articles of diet of growing boys and girls. Alcohol in any form is unnecessary and undesirable for young persons; even to the weak and delicate a cup of beef tea will be found to be more sustaining and stimulating than the "strengthening glass of port wine" which anæmic little girls are often persuaded to take.

The anæmia of school girls at the age of puberty is frequently caused by an insufficient meat dietary at school. Between the ages of twelve and sixteen, girls develop with great rapidity, both mentally and physically. The calls on their physical constitution are great, and can only be responded to by the body being well supplied with the materials out of which to manufacture energy and the elements of repair—in other words, by having girls well fed. It may be interesting and instructive to recall one's own experience of youth, and to record a dietary based on rigid principles, adopted and enforced to maintain health and to banish daintiness. One of a large family of children, I remember well the nursery and schoolroom dietary and regimen, to which all were submitted up to the age of fifteen. It was as follows: For breakfast, oatmeal porridge with milk and sugar, or bread and milk, on alternate days of the week, except on Sundays, when one boiled egg and bread and butter were allowed. For midday dinner the fare was roast or boiled joint, with potatoes and vegetables, and a sweet pudding or pie; for tea, bread, butter and jam. There was no restriction as to quantity, but what we took

on our plates we were obliged to eat, it being looked upon as a disgraceful sign of greediness to take more than one could consume, or to ask for a second helping when appetite was satisfied. If we did so we were made to feel the discomfort of surfeit, a sure way of checking greedy demands for "more". As we lived in the country, ripe fruit and fresh milk were supplied *ad libitum*. Every day we were obliged to walk six miles along the roads and lanes, to go through half an hour's calisthenic exercises, and to have six hours' lessons. Riding on horseback, gardening, and playing filled up the rest of the time of a happy, healthy, and vigorous childhood. These personal reminiscences may be pardoned, as they illustrate my point that the dietary of children should be plain and abundant.

In adult life.—When the processes of digestion and assimilation are active, when all the organs are healthy and the body has the power of eliminating and discharging effete products, the intake of food may be in excess of the actual needs of the body, without harm. This is true, however, only so long as active muscular exercise is taken, or great demands are made on the energy of the whole system. Englishmen are said to be the greatest meat eaters in the world, and they carry their carnivorous habits to whatever part of the world they inhabit, whether it be the tropics of India or the wintry plains of Canada; but they are at the same time the greatest athletes in the world, and the people of the most devouring and restless energy. The youth of England expend much of their strength and energy in walking, boating, cricket, tennis, and football, and if they did not do so they would soon become—if they continued the same diet—a dull, phlegmatic, and stupid race.

The bilious attack a warning.—The generous diet of adolescence, even of those who undertake active muscular exercise, must, however, be watched with care. The recurrent bilious attack, the frequent headache or *migraine*, or an increasing deposit of fat, show that the supply of

food is greater than the demands of the body require, and must be decreased if health is to be maintained.

"I can accustom my body to ring alarums for food whenever I choose," said the wise Locke; and the regular recurrence of appetite at certain intervals and hours is no certain sign, in such an automatic organ as the stomach, that food is absolutely required by the body. In a very few days a healthy person can easily accustom himself to get hungry at any hour of the day he chooses, or which is convenient for meals.

The diet of the sedentary.—If, however, an abundant dietary is dangerous, unless carefully watched by those who take daily active muscular exercise, it is more than dangerous, it is disastrous, to those who lead sedentary lives, or who are brain-workers. The great majority of our adult middle-class population in cities lead sedentary lives; and it may be said unhesitatingly that they, as a rule, consume far too much albuminous food, butcher's meat in particular. The albuminoids of the food, being not fully oxidised in the body by muscular exercise, remain as effete products, and ultimately give rise to dyspepsia, liver complaints, gout, and Bright's disease.

Ill-temper a symptom of excessive meat-eating.—One deplorable result of excessive meat-eating in England is the ill-temper which is a chronic moral complaint among us. In no country, I believe, is home rendered so unhappy and life made so miserable by the ill-temper of those who are obliged to live together as in England. To everybody who reads these lines, examples will occur of homes which are rendered quite unnecessarily unhappy, when they might be happy, by the moroseness and rudeness of the head of the family, by the peevishness of the wife, or by the quarrelling of the younger members. If we compare domestic life and manners in England with those of other countries where meat does not form such an integral article of diet, a notable improvement will be remarked. In less meat-eating France, urbanity is the rule of the home; in fish-

and rice-eating Japan, harsh words are unknown, and an exquisite politeness to one another prevails even among the children who play together in the streets. In Japan I never heard rude angry words spoken by any but Englishmen. I am strongly of the opinion that the ill-temper of the English is caused in a great measure by a too abundant meat dietary combined with a sedentary life. The half oxidised products of albumen form urates and uric acid, which, circulating in the blood, produce both mental and moral disturbances.

The diet of the athlete.—On the other hand it may be justly urged that though the too liberal use of meat by those who live sedentary lives and who are past middle age is strongly to be deprecated, and though it is a fact that beans and grains can furnish a large supply of albuminous food, yet there is an abundance of evidence in support of the opinion that no diet is so favourable to the production of that condition of the muscles which enables a man to undergo prolonged and excessive muscular exertion, as lean meat, particularly beef. Under this diet the muscles seem to attain a firmness and contractile power not otherwise produced. During the training of athletes the diet consists of underdone meat and a small amount of bread and vegetables, fluids are restricted, and only a small quantity of tea and beer is allowed, all sweets, pastry, puddings, entrées, sauces, pickles, and condiments are strictly forbidden. This diet, accompanied with exercise, will in about the space of six weeks reduce all superfluous fat, and give the muscles firmness, bulk and great contractile power.

Meat necessary for continuous exertion.—In countries where continuous physical exertion is the necessity of life, man has generally discovered for himself, without the teaching of science, the great value of a meat diet. Thus, in the limitless plains of the Pampas, which can only be traversed on horseback, the Indians have learnt by experience that meat alone will give them the muscular force to

gallop all day long. Sir Francis Head, in his account of his "Journeys Across the Pampas," tells how he could not stand the fatigue of constant galloping, but was obliged, after five or six hours' riding, to rest in a carriage, till he had adopted the diet of the Indians, and lived on beef and water. "But after," he says, "I had been riding for three or four months, and had lived on beef and water, I found myself in a condition which I can only describe by saying that I felt no exertion could kill me." Vegetable feeders may be and are capable of great feats of strength; but the capacity to endure prolonged physical exertion belongs to the meat-eater. The gentleman may dispense with butcher's meat without harm; the navvy and miner require beef and mutton. In fact, in this topsy-turvy world the under-fed are the poor working men, who need food whereby to work, and the over-fed are the well-to-do middle-aged, who should be abstemious in order to enjoy the good things with which their lives abound. A community of goods might be to the benefit of both.

Brain-workers should live sparingly if they would work well and live long. Their force is required for mental exertion, and should not be expended on the task of digestion, for "they should remember that the digestion of heavy meals involves a great expenditure of nerve force". Besides fish, eggs, milk, and light porous well-made bread, fresh vegetables and fruit should form their chief sustenance. They should take only a small amount of butcher's meat, and that especially at those times when they are able to take more physical exercise. Some animal fat is, however, useful, such as fresh butter or cream, or a rasher or two of fat bacon at breakfast (Burney Yeo).

Women, whose bodies are smaller and whose energy is less, require, as a rule, less food than men; but the same strict dietetic rules cannot be adopted by them as by the other sex, for during menstruation, pregnancy, and lactation, demands are made on their physical and nervous systems which can only be met by a more abundant food supply specially rich

in albuminoids. Their diet must, therefore, be regulated more or less by the varying circumstances of their physical condition. Women, however, who lead sedentary lives—and they are the great majority—must remember that a dietary of which meat, eggs, and milk form a large part, is not conducive to health ; while, on the other hand, if obesity is to be avoided, farinaceous and saccharine foods must be taken with precaution. The healthful thing to do is to lead an active and unselfish life, on a moderate diet, sufficient to maintain strength and not to increase weight.

CHAPTER X.

UNDER-FEEDING AND OVER-EATING—(*continued*).

The Food and Feeding of the Aged.

It may seem hard that the man who in youth has known the pinch of poverty, who remembers how the cut of mutton, with a supply of potatoes and greens, scarcely sufficed for a vigorous appetite, should find that in the prosperity of later life an eight-course dinner of delicacies fails to tempt him; but that, nevertheless, his physician warns him that the attack of gout from which he is suffering means that he is eating too much, and that his diet must be lowered. Is life, then, never to give satisfaction? Must youth always know desire and old age satiety? Must the poor muscle-worker never have enough food to give energy to his frame, and must the rich idler have so much to eat that disease is the consequence? To find the happy mean, to live according to sweet reasonableness and knowledge, is the aim of the teachings of science, and if to these are added the principles of Christian communism, the wealth of later life will not lead to self-indulgence, but to the mitigation of the sufferings of those who want the means of life. Of this result, all know many splendid examples. I recall one of a gentleman, now in possession of a very large income, who told me that in his youth he lived on a salary of 10s. a week. He early made up his mind that to eat little and drink less would be his rule in life. To this resolution he has adhered, though fortune has come to him. Nearly an octogenarian, he is still a man of untiring vigour of body and mind. Simple in life, he dispenses his

great fortune as a custodian for his Master, while living amid the refinement and cultured surroundings proper to an English gentleman.

In advanced life tissue change is slow, digestion is less active, and the ability to assimilate food is greatly diminished. As middle age is passed and old age approaches, the intake of food, particularly of nitrogenous and fatty foods, must be steadily diminished. Sir Henry Thompson, who has written forcibly on this subject, says: "As we increase in age, less energy and activity remain, and less expenditure can be made, less power to eliminate at fifty than at thirty, still less at sixty and upwards. Less nutriment must, therefore, be taken in proportion as age advances, or rather as activity diminishes, or the individual will suffer. If he continues to consume the same abundant breakfasts, substantial lunches, and heavy dinners, which at the summit of his power he could dispose of almost with impunity, he will in time either accumulate fat, or become acquainted with gout and rheumatism, or show signs of unhealthy deposit of some kind in some part of the body, processes which must inevitably empoison, undermine, or shorten his remaining term of life. He must reduce his intake because a smaller expenditure is an enforced condition of existence. At seventy the man's power is still further diminished, and the nutriment must correspond thereto if he desires still another term of comfortable life. And why should he not? Then at eighty, with less activity, there must be still less 'support'. And on this principle he may yet long continue to live."[1]

The kinds of food which the elderly should particularly diminish are the nitrogenous and fatty varieties. Growth has ended, tissue change is slow, the energy which induced activity is gone, and nitrogen is no longer required to build up, after the ceaseless wear and destruction of the body. To persist in taking nitrogenous or meaty foods after middle age is passed, is to throw a burden on the

[1] *Diet in Relation to Age and Activity.* By Sir Henry Thompson.

kidneys which they are not able to bear, and the diseases of gout, rheumatism, renal cirrhosis, and apoplexy are the result.

In old age, the power of fasting is not so great as in earlier life; and the meals, while being smaller, should therefore be more frequent, the intervals between them being short. A small amount of alcohol with food is also often beneficial to the aged. The long fast of the night, during which sleep is not sound, is ill borne, and a glass of milk, or a cup of beef tea, may often be taken in the night with advantage. It is difficult to lay down any fixed rules for the dieting of the old, for age is not according to length of years, but to the number of infirmities. We all know men of seventy-five who are as active, physically and mentally, as others of sixty. Sir Henry Thompson's rule is the best, namely, to diminish the intake of food as activity diminishes. As age increases, let the quantity taken be less, and let fish and poultry take the place of butcher's meat, and farinaceous foods of highly-flavoured dishes. Saccharine will be found a useful substitute for sugar, and cream for oily fatty foods. A nourishing stimulant to be highly recommended, and which may be taken between meals, is an ounce of dry cherry brandy mixed with a wineglassful of cream.

Centenarians.—Sir George Humphry has investigated the life-histories of centenarians in England, with the view of ascertaining the causes and circumstances of longevity. The report was published by the Collective Investigation Committee of the British Medical Association in 1887. As one reads of the habits and lives of these men and women who attained to the age of one hundred years and more, one is struck by the fact, that they were almost invariably lean people, of spare habit, and of great moderation in eating and drinking. Of thirty-seven, three took no animal food, four took very little, twenty a little, ten a moderate amount, and only one acknowledged taking much meat. With regard to alcohol, the returns are much the same, and abstemiousness is found to be the

rule of life of these centenarians. Fifteen had been total abstainers, either during the whole or part of their lives; two took very little alcohol, twenty-two a little, and ten a moderate amount. Sir George Humphry's interesting and valuable collection of facts regarding centenarians confirms opinions which have been held from time to time by various persons, in opposition to the generally accepted view that as age increases and strength diminishes, food should be more stimulating and strengthening.

Cornaro's precepts and practice.—The most remarkable of these persons was Cornaro, an Italian nobleman, who lived in the fifteenth and sixteenth centuries, and who attained the age of upwards of a hundred years. He seems in middle life to have suffered from dyspepsia, brought on by over-indulgence; for he says that he had "fallen into different kinds of disorders, such as pains in my stomach, and often stitches, and spices of the gout, attended by, what was almost still worse, an almost continual slow fever, a stomach generally out of order, and a perpetual thirst." At the age of forty, he decided that abstemiousness and regularity should be the order of his life, instead of the previous course of indulgence in eating and drinking, which was surely driving him to his grave. He kept his resolution for a year, at the end of which time he declared himself free of all his complaints. He states that his rule was to take as much food and wine as would check appetite without completely satisfying it. "I accustomed myself," he says, "to contrive matters so as never to cloy my stomach with eating and drinking; but constantly to rise from the table with a disposition to eat and drink still more. . . . What with bread, meat, the yolk of an egg, and soup, I ate as much as weighed in all 12 oz., neither more nor less. I drank in all 14 oz. of wine." Cornaro lived on this meagre diet to a vigorous old age. He wrote several treatises on the subject of diet, urging others to follow his example; one of these was written when he had attained the age of ninety-five, and shows that he was in full possession of his faculties.

CHAPTER XI.

UNDER-FEEDING AND OVER-EATING—(*continued*).

Dishes for the Aged.

After having insisted, as I have done, upon the necessity of diminishing the intake of food, particularly of albuminous foods, in old age, it will not, I think, be out of place if I give a few recipes to show how the aged may be well fed on a light diet. Fish and poultry should take the place of butcher's meat. Besides the ordinary methods of boiling, frying and baking fish, soups and delicate dishes may be made of fish, which will be found to be not only appetising but satisfying to those on whose muscular powers but slight demands are made. Fish contains a third less of albuminoids than ordinary meat, and is hence very suitable as an article of diet for the old. Sir Henry Thompson, to whose scientific and practical studies on food we owe so much, points out that, besides the well-known sole, turbot, salmon, whiting, haddock, mackerel, cod, trout, smelt, herring, skate, and mullet, there are other kinds of fish admirable for food, which yet are almost totally neglected by the British housewife. These are the wolf-fish or cat-fish, the halibut, sea bream, bass, gurnet, ling, hake, thornback, pollock, and coal-fish, to which may be added the conger, excellent for making soups and stews, and the sturgeon (of which the flesh approaches that of meat in quality). The following are Sir Henry Thompson's recipes for fish soup :—

1. Put three ounces of butter into a stewpan, add two carrots sliced, one onion, and a shalot in thin slices, then cloves, a little thyme, and some parsley. Fry them gently until of a reddish tint, then add three pints of cold water. Let it boil, skimming occasion-

ally. Then add a small fresh haddock, bones and all, cut up into pieces, and the head and bones of two whitings, setting aside the fillets; a cod's head or that of a turbot, or the fresh bones, head, and fins of two large soles, the fillets of which are required for another dish, may take the place of the foregoing. Add some salt and a little pepper. Let all simmer together for two hours gently at the corner of the fire; take out the bones, and pass all the rest through a coarse strainer. Divide the fillets of whiting into two or three small portions each; boil for a few minutes in some of the stock, add a little fresh green chervil and parsley chopped not too finely, and serve all together in a tureen. This soup may be thickened if desired by adding a tablespoonful of white "roux," that is a little flour well mixed with butter in a stewpan over the fire, cooked but not allowed to brown. This is unquestionably an improvement. Fillets of other fish may be substituted for those of the whiting, or a few shell fish or oysters if they are well digested.

The following is the receipt for an economical fish stew:—

2. Take three or four pounds of hake, ling, skate, or haddock, and one pound of "cuttings or trimmings," which are the best part of the fish for stock making. Remove all the fish from the bones, break up or pound the latter, and set aside with any portion of head there may be and the cuttings. Put into a saucepan over the fire two ounces of lard and two or three onions sliced, and let them fry until brown; then add two quarts of water and all the pounded bones and trimmings, some parsley or other green herbs, pepper and salt. Let the whole simmer for three hours, adding the amount of water lost by evaporation. Strain out the bones, bits of skin, etc., add the fish in pieces, and boil gently ten or fifteen minutes. Thicken with sufficient flour mixed smoothly with a small portion of stock, and added before finishing. In order to make the dish complete and substantial a few small suet dumplings should be well boiled and put into the tureen.

Stewed Cod.

Have ready some boiling water in a saucepan and put a little salt in it. Take a slice of cod about an inch thick and half a pound in weight. Clean it and put it into the boiling water and let it boil gently for five minutes; then lift it out and let it drain. Have ready heated in a stewpan one gill of veal gravy or good broth. Put the cod in this and stew it for five minutes; then add a tablespoonful of very fine bread crumbs, and let it simmer for three minutes. Mix a tea-

spoonful of arrowroot and half a teaspoonful of anchovy sauce, with a dessertspoonful of sherry, and a teaspoonful of lemon juice, and stir it well into the gravy. Boil all together for two minutes, then lift the fish out carefully with a fish slice. Pour the sauce over it and serve it quickly. Half a dozen oysters, bearded and added with their strained liquor two or three minutes before the cod is taken out of the stewpan, improve this dish.

Haddock Pudding.

Boil a haddock weighing about one pound for about ten to fifteen minutes in boiling water with a little salt and a tablespoonful of vinegar. Remove all the skin and bones, and cut the fish in small pieces. Boil half a pound of potatoes in salt and water until they are soft, then rub them through a sieve and mix them with the fish. Add one raw egg, an ounce of butter, and a little pepper and salt. When thoroughly mixed make the compound into any shape preferred; put it into a buttered tin and bake it until it is of a golden colour. Serve the pudding with egg sauce made as follows: Mix one ounce of butter with one ounce of flour in a saucepan over the fire. Add gradually one gill of the water in which the haddock was boiled, and one gill of milk. Stir over the fire for ten minutes; then add two hard-boiled eggs which have been cut into very small dice, and a few drops of lemon juice. Pour this sauce round the fish pudding.

Macaroni and Fish.

Cut a quarter of a pound of well-boiled macaroni into small pieces. Take away the skin and bones of a quarter of a pound of cold boiled fish. Mix the macaroni and fish well together, with a little pepper and salt, half a pint of good fish or chicken broth, and one ounce of butter. Put the mixture into the oven, and when it is quite hot and brown it will be ready to serve.

Kedgeree.

Warm in a saucepan, stirring all the time, a quarter of a pound of cooked fish, a quarter of a pound of rice after it has been boiled, and one ounce of butter. Beat up one egg, with a little pepper and salt. Add it to the fish and rice, and cook altogether for two minutes. If it be too stiff, add a little milk.

The Pot-au-Feu.

The pot-au-feu as prepared in France is savoury and nutritious. The following recipe is adapted from *Le Livre de la Cuisine*, by T. Gouffe:—

In a tin-lined iron or copper pot, place about two pounds of the leg or shoulder of beef, and half a pound of bones broken into fragments, in four quarts of cold water. The bones should be put in first, then the meat tied up to preserve its shape, add one ounce of salt, place the pot over a steady clear fire which will give a constant gentle heat, bring the water to the boil and skim carefully. As soon as the scum rises pour in a little cold water; let the water boil three separate times, skimming each time. Then add the vegetables, which should consist of a pound of cut carrots, onions, and turnips, half a pound of leeks, an ounce of parsnips, half an ounce of celery, and three cloves stuck in an onion. The throwing in of the vegetables will temporarily check the boiling. As soon as the water is brought to the boil again, draw the pot aside and place it on a spot on the fire or the hot plate where it will simmer gently and steadily for three hours. The vegetables should be left only just long enough in the broth to cook them. When done the meat is withdrawn, and while still on the fire the broth is freed perfectly from grease. In France this thoroughly-boiled beef is eaten as a separate dish, either hot with the vegetables, or cold served with oil and vinegar. The broth is frequently served with *croutons* of toast, or with the leaves of boiled spring cabbage floating in the tureen.

Sweetbread Soup.

Boil a pair of sweetbreads for five minutes with a little water; skin, trim, and boil them gently in one and a half pints of white stock, with a bouquet of herbs, a piece of celery, or as much celery seed as will lie on a threepenny piece, and a shred of mace, until they are quite tender. When they are quite soft either pass them through a hair sieve or chop them finely. Remove the herbs, add a little pepper and salt, a few drops of lemon juice, and a gill of cream.

Brunoise Soup.

Take one young carrot, half a young turnip, two leaves of celery, a little of the flower of a boiled cauliflower, one onion, one ounce of butter, one pint of water in which the cauliflower was boiled, one pint of milk, one teaspoonful of salt, pepper, and two ounces of stale bread toasted. Stew the ingredients, except the toast, together for one hour; then break the toast in pieces, add it to the rest and stew all together for another hour. Pass all through a sieve and return it to the stewpan to get hot.

Maigre Soup.

Shred one pound of potatoes, and put them with one leek, one onion, and one ounce of butter into a pint of boiling water in a stew-

pan. Boil until the vegetables are soft, then pass them through a sieve, adding a pint of hot milk to help them through. Put all into the stewpan, and stir until it boils, then sprinkle in one tablespoonful of Groult's tapioca. Boil until the tapioca is clear; flavour with a little ground mace, pepper and salt, add a little lemon juice, and a tablespoonful of chopped parsley.

Steamed Asparagus.

Trim the asparagus, then steam it by putting it in a jam-pot nearly filled with boiling water, placed in a large saucepan half full of boiling water and tightly covered. The asparagus will take nearly an hour to cook in this manner. Serve with it a sauce made of one ounce of butter melted over the fire, one tablespoonful of cream, the yolk of an egg, and five drops of lemon juice. Stir the mixture in an enamelled saucepan over the fire for three minutes.

Apple Snowballs.

Boil half a pound of the best rice in boiling water for fifteen or twenty minutes. Strain it and spread it on floured cloths. Peel and core one or two apples and put them on the rice. Sprinkle over them sugar and a little lemon juice, then cover each one entirely with rice, tie the cloths, and boil them for an hour.

For many of these practicable recipes I am indebted to that excellent and valuable manual, *The Art of Feeding the Invalid*.[1] They might be multiplied indefinitely. The principle to be remembered is that the food of the aged should be light, farinaceous, and easily digested. Among things to be recommended, I might mention also all kinds of fish, rice, tapioca, arrowroot, sago, custard, and bread and butter puddings, poultry, game, fresh vegetables, ripe fruit, omelette, junket, and milk. The food of extreme old age compares with that of extreme youth, and for toothless age pap is as useful as to the teething babe, nor must it be thought that the dentist's art gives the stomach the power to digest the strong meats suitable to youth.

[1] *Scientific Press*, 428 *Strand*, *W.C.*

CHAPTER XII.

ON THINNING AND FATTENING.

Thinning the Fat.

The accumulation of fat in the body is a frequent condition after the age of forty. Those who have read the previous chapters will not be surprised to learn that this accumulation of fat is generally due to the intake of food being larger than is necessary for the requirements of the body. "Why, I am a very small eater, and yet I grow fat," is the indignant exclamation; for there is nothing people resent so much as being told that they eat too much. The inexorable fact, however, remains that if you grow fat, you either take too much food in bulk, or too much food of a certain kind, that is of a fattening kind. This excess may be every day exceedingly small, and yet in the course of a year, or a series of years, it results in transforming a once graceful figure into an unwieldy shape, and an active energetic person into one to whom movement and exercise are repugnant. Dr. Burney Yeo has shown in a very practical way how a large accumulation of fat may take place in a few years from a very small cause. He instances the case of a person who daily takes in excess of his wants half an ounce (about two lumps) of sugar. This sugar not being required and burnt off is converted into fat, and stored up in his body as such. This daily consumption of sugar, and this daily storage of fat, will result in one year in increasing the weight of a person eleven pounds, and in five years in raising it no less than four stones. From this example it is seen how in middle age, when metabolism is slow, a small excess of fattening foods will lead to obesity by imperceptible

degrees. It rarely has the same effect in youth, when the body is able to consume and get rid of much larger quantities of food. There are, it is true, certain cases of obesity which are pathological instead of physiological; these are generally associated with anæmia, or with fatty degeneration of the heart, leading to imperfect oxidation in the tissues, or with hysteria. Such cases are not within the range of this work, and should be treated by the physician.

Treatment.—In the treatment of ordinary obesity there are certain definite principles to be followed.

1. To oblige the body to feed for a while on itself, and to consume its own fat;

2. To prevent the re-accumulation of fat.

Both these conditions can be accomplished by diet.

Before commencing the dietetic treatment of obesity the patient should undergo a careful physical examination by a physician to ascertain if the organs, particularly the heart and kidneys, are sound. Some of the systems in vogue for reducing fat tax these organs severely, and if there are any signs of incompetency or disease of the heart or kidneys, the system adopted should be modified accordingly. It will be remembered, that when explaining the action of hydro-carbons and carbo-hydrates in the body, it was stated that carbo-hydrates—*i.e.*, starchy and sugar foods—are the substances out of which adipose tissue is manufactured; but that, as in the case of fattening pigs, the production of fat in the body is much more rapid if fatty foods are taken in combination with starchy foods. Thus it was shown that pigs fatten much more rapidly on meal and greasy pig-wash than on meal alone. From these facts we infer that the ordinary mixed diet of adults, consisting of meat, fat, and farinaceous foods, is, after the period of youth and activity is passed, liable to cause an excessive deposit of fat. The indication is, therefore, to cut off the farinaceous foods, and, according to some authorities, to cut off the fatty foods as well. It is not, however, sufficient to reduce the consumption of fatty and farinaceous foods; the

intake of food, and more especially of fluid food, must be reduced generally. It is useless for the fat person to say: "I will not diet myself, I will take more exercise". If he increases exercise he will probably increase appetite, and consequently the intake of food. He must increase exercise and decrease the intake of food, being willing to suffer even for a time the pangs of hunger until the body learns to feed upon itself and habit has modified appetite.

There are three typical and well-known methods of treating obesity.—One has a wide popularity, and is known by the name of its inventor, *Banting*. This system consists in increasing the amount of albuminous or meat foods, and of greatly decreasing both the fat and starchy foods. The second is that advocated by *Ebstein*, the German physician, in which the albuminous foods are greatly diminished, and the starchy foods still more so, but the amount of fat taken is normal. The third is that practised by *Oertel*, in which the albuminous foods are increased, and the fats and carbo-hydrates reduced to about a fourth of the normal. All the methods agree in one particular, that is, in reducing the total bulk of the food taken. Thus, while the normal amount of food consumed by a healthy man will amount in grammes to 618, Banting would reduce this to 260, Ebstein to 235, and Oertel to 280. The following table (taken from Dr. Burney Yeo's book) clearly states the kind and quantities of food allowed :—

	Albuminates.	Fats.	Carbo-hydrates.
Normal average of grammes	130	84	404
Banting	170	10	80
Ebstein	100	85	50
Oertel	155 179	25·40	70·10

The Banting regime was as follows :—

Breakfast, at 9 a.m., to consist of 5 to 6 oz. of animal food—meat (except pork and veal) or boiled fish; a little biscuit, or 1 oz. of dry toast—6 or 7 oz. of solids in all. A large cup of tea or coffee (without milk or sugar)—9 oz. of liquids.

Dinner, at 2 p.m.—Fish or meat (avoiding salmon, eels, herrings, pork, and veal), 5 to 6 oz., or any kind of poultry or game. Any vegetables, except potato, parsnips, beetroot, turnips, or carrot. Dry toast, 1 oz. Cooked fruit, unsweetened. Good claret, sherry, or Madeira, 10 oz. Total of solids, 10 to 12 oz.

Tea, 6 p.m.—Cooked fruit, 2 to 3 oz., a rusk or two; 2 to 4 oz. of solids; 9 oz. of tea without sugar or milk.

Supper, 9 p.m.—Meat or fish, as at dinner, 3 to 4 oz. Claret or sherry and water, 7 oz.

On this diet Mr. Banting reduced himself in one year from 14 st. 6 lb. to 11 st. 2 lb. There is, it will be noted, the greatest possible limitation of carbo-hydrates and fats, they being reduced from the normal of about 500 to less than 100. The large amount of meat taken in the Banting *régime* is extremely distasteful to some people, and in the cases where the kidneys are not healthy, or where there is a tendency to rheumatism, this severe dietary may be actually injurious.

The Ebstein regime is based on the theory that it is the starchy and saccharine foods, not the fats, which form fat, and that it is not necessary to reduce the latter. In fact, Ebstein contends that the ingestion of fat is useful in curing obesity, if combined with a greatly reduced food supply in albuminates and carbo-hydrates, as fat abates appetite and diminishes thirst. About half the usual amount of meat is allowed. As seen from the following dietary the Ebstein diet is very meagre, although it does contain butter and fat:—

Breakfast (6 a.m. in summer, 7·30 in winter).—White bread, well toasted (rather less than 2 oz.) and well covered with butter. Tea, without milk or sugar, 8 or 9 oz.

Dinner, 2 p.m.—Soup made with beef marrow. Fat meat with fat gravy, 4 to 5 oz. A moderate quantity of one of the vegetables allowed, namely, asparagus, spinach, cabbage, peas, and beans. Two or three glasses of light white wine. After this meal a large cup of tea, without milk or sugar.

Supper, 7·30 p.m.—An egg, a little roast meat with fat, about an ounce of bread well covered with butter, a large cup of tea, without milk or sugar.

In the Oertel system the maintenance of the general health is carefully considered while the fat of the body is being reduced. Steady walking exercise to strengthen the muscles of the heart is insisted upon, and walking slowly uphill and going upstairs are especially advocated. The quantity of fluid drunk is diminished, while perspiration is promoted by baths; the normal condition of the blood is maintained, and wasting of the muscles prevented by an albuminous diet. The diet may be as follows:—

Morning.—One cup of coffee or tea, with a little milk, altogether about 6 oz. Bread, about 3 oz.

Noon.—3 to 4 oz. of soup; 7 to 8 oz. of roast or boiled beef, veal, game, or not too fat poultry, salad or a light vegetable, a little fish (cooked without fat) if desired, 1 oz. of bread or farinaceous pudding (never more than 3 oz.), 3 to 5 oz. of fruit, fresh preferred, for dessert. It is desirable at this meal to avoid taking fluids; but in hot weather, or in the absence of fruit, 6 to 8 oz. of light wine may be taken.

Afternoon.—The same amount of coffee or tea as in the morning, with at most 6 oz. of water; 1 oz. of bread occasionally.

Evening.—One or two soft-boiled eggs, 1 oz. of bread. Salad and fruit; 6 to 8 oz. of wine, with 4 or 5 oz. of water.

It will be noticed that fluid is either forbidden at meals or taken in very small quantities. There is no doubt that taking soup and large quantities of fluid with food increases obesity.

Dietetic rules.—None of the rigid dietaries given above could be followed by all persons alike; the amount of food necessary for a large active person would be excessive for one of small stature and indolent habits. Each case must be treated more or less on its merits, remembering always that there are certain broad principles to be followed. Decrease the total amount of food taken, and strictly limit the amount of drink; cut off all sugar, beer, and spirits; eat no potatoes, bread, puddings or pastries; skim all milk, take no soups or fancy dishes; take a fair amount of roast or boiled meat, with fish, game, poultry, and eggs,

as well as vegetables and fruit. Take steady exercise, and promote the action of the skin.

The Carlsbad regime.—A little personal experience may be useful after so much theory, and it may be interesting to my readers who suffer from too great an abundance of fat to learn how I put theory into practice and reduced my weight 15 lbs. in three weeks. This result was obtained at Carlsbad, and the *régime* was as follows: Rose at six, took three tumblers of hot Sprudel water, walking for about twenty minutes between each glass. Breakfast at eight, consisting of one or two small crescents of bread and a boiled egg. On alternate mornings a vapour bath with cold douche, or general massage of the body. Dinner at one o'clock, consisting of a small amount of fish and meat, or poultry, with green vegetables ; no potatoes or sweets. In the afternoon a walk of from six to eight miles up the hills in a flannel dress. Supper at seven, consisting of a poached egg, or a small cut of cold meat. There is no doubt that I suffered from constant hunger on this limited diet ; but under it my weight steadily diminished, and a feeling of lightness and well-being took the place of previous heaviness. Continuing the diet after I left Carlsbad, I lost another six pounds, and it was some years before the tendency to increase in weight showed itself again. I am quite certain that no one need fear becoming a ponderous size, a source of discomfort to themselves and of disagreeable impressions to others, if they checked the beginning of obesity by suffering the small inconvenience of submitting to a restricted diet for a time.

CHAPTER XIII.

ON THINNING AND FATTENING—(*continued*).

Fattening the Thin.

THERE is no doubt that in spite of the controlling influence of diet, some persons have a tendency to grow fat, and that others either become or remain thin. It is more difficult to make a person thin by nature grow fat, than to reduce a fat person. The articles of food—the butter, cream, puddings, and sweets—which are eliminated from the dietary of the fat, may be greatly increased in the dietary of the thin, often without making any marked difference in their condition and weight. By a strange perversity of nature also the thin person frequently dislikes the food that would make him grow fat. It is probable, moreover, that the greater activity of the spare body keeps it thin.

When, however, thinness becomes progressive, and approaches emaciation, and is moreover associated with anæmia, weakness, and that group of nervous symptoms known under the name of hysteria, it may be very successfully treated as a symptom of a disease of nutrition.

The Weir-Mitchell treatment.—This system of treatment consists in rest, isolation, over-feeding, passive exercise or massage and electricity, and is known by the name of its founder, Dr. Weir-Mitchell. The patient is taken from home and strictly isolated from friends and family ; she is put to bed, and in extreme cases is not even allowed to sit up in bed, but is fed by a nurse. The patient should be weighed before being put to bed, and should be weighed at frequent intervals during the treatment. She is first placed on a milk diet, and for the first day or two from three to

four ounces of milk are given every two hours. The milk may be slightly warmed, and if it is particularly distasteful to the patient it may be flavoured with a little tea or coffee. The quantity of milk taken is gradually increased, and the intervals lengthened to three hours, till at last two quarts are taken in the twenty-four hours. This rest in bed and the simple milk diet "nearly always dismisses," says Dr. Weir-Mitchell, "as if by magic, all the dyspeptic conditions" from which the patient had previously suffered. The circulation is at the same time stimulated, and the muscles undergo passive exercise by being kneaded by massage and moved by electric currents. The bowels are carefully regulated. After from four to seven days a little solid food is taken, namely, bread and butter for breakfast, and a milk pudding for dinner. A day or two later, fish and chicken or a mutton chop are added, first either at the mid-day or evening meal, and then at both. In about ten days the patient is put on three full meals daily, and the diet is as follows :—

MILK, sixty to eighty ounces.
BREAKFAST, porridge and cream.
SECOND BREAKFAST, cocoa and egg, bread and butter.
LUNCHEON, fish, bread, pudding, and milk, or chicken, vegetables, and pudding.
DINNER, mutton or beef, two or three kinds of vegetables, milk pudding, or stewed fruit with cream.

Extract of malt may be given with one or more of the supplies of milk, and in some cases cod-liver oil is also prescribed.

Dr. Weir-Mitchell says of this treatment: "No troublesome symptoms usually result from this full feeding, and the patient may be made to eat more largely by being fed by her attendant;" and as to the beneficial effect, he says: "I have watched again and again, with growing surprise, some listless, feeble, white-blooded creature learning by degrees to consume these large rations, and gathering under their use flesh, colour, and wholesomeness of mind".

Tonics are also given in rather full doses, iron, arsenic, and sulphate of strychnine. Where there is no alcoholic habit to break, a small daily dose of whisky or wine is found to assist in the decrease of fat. As the diet is increased and maintained at its highest point, it is necessary to carefully watch the urine, and if an excess of urates is found, it is an indication that the amount of food must be reduced.

At the end of five or six weeks the patient will be found to have gained considerably in weight and strength, and the muscles to have become firmer and fuller. The massage can then be decreased, and normal exercise on foot allowed. The excessive diet is also slowly reduced; the quantity of the milk is first lessened, then the intermediate meals are dropped, and gradually the patient returns to a normal, active, open-air life. The cure may be completed by a sea voyage or a foreign tour; and the patient, once restored to health and family, and to a life of interest and usefulness, rarely relapses. The following cases will illustrate the treatment and its results :—

UNDER DR. WEIR-MITCHELL.

Mrs. C. Kept in bed and fed by an attendant.

First day.—One quart of milk in divided doses every two hours.

Second day.—Cup of coffee on waking. Two quarts of milk in divided portions every two hours.

Third to sixth day.—Same diet.

Seventh, eighth, and ninth days.—Same diet, with a pint of raw soup in three portions.

Tenth day.—7 a.m., coffee; 7·30, half-pint of milk; 10 a.m., ditto; noon, 2, 4, 6, 8, and 10 p.m., ditto; soup at 11 a.m. and 5 and 9 p.m.

Fourteenth day.—Egg and bread and butter added.

Sixteenth day.—Dinner added and iron.

Nineteenth day.—The entire diet was as follows: 7 a.m., coffee; 8 a.m., iron and malt extract; breakfast, consisting of a chop, bread and butter, a tumbler and a half of milk; 11 a.m., soup; 2 p.m., iron and malt; dinner of anything she liked, with 6 oz. of Burgundy or dry champagne, and at the end one or two tumblers of milk; 4 p.m., soup; 7 p.m., malt, iron, bread and butter, usually some fruit, commonly two glasses of milk; 9 p.m., soup.

(At 12 noon massage for an hour; at 4·30 p.m. electricity applied for an hour.)

At sixth week soup and wine were dropped, iron lessened one half, massage and electricity only on alternate days.

At ninth week milk reduced to a quart. All mechanical treatment ceased.

Result.—Gain in flesh about face in second week. Weight rose in two months from 96 to 136 lbs.; gain in colour equally marked. At ninth week drove out. Cure complete and permanent.

Under Dr. Playfair.

A. B., aged 32. Rest in bed, isolation.

First day.—22 oz. of milk in divided doses.

Second day.—50 oz. of milk in divided doses.

Third day.—50 oz. of milk in divided doses. Massage half an hour.

Fourth day.—50 oz. of milk in divided doses; egg and bread and butter; 40 minims of dialysed iron in two doses. Massage 1½ hours.

Eighth day.—50 oz. of milk in divided doses, mutton chop, porridge, and a gill of cream; maltine twice daily. Massage three hours, electricity half an hour; continued to end of treatment.

Fifteenth day.—Three full meals daily of fish, meat, vegetables, cream, and fruit; two quarts of milk, and two glasses of Burgundy.

Twenty-second day.—Amount of food lessened.

Result.—On twenty-second day sat in a chair for an hour; after a month walked downstairs, and went for a drive. Enormous increase in size. Cure complete and permanent.

The blood should be examined.—The success of this treatment is now established. Dr. Weir-Mitchell is anxious to insist on the fact that increase of weight should correspond with increased richness of blood. The number and colour of the red corpuscles of the blood should be examined and estimated during treatment. This is easily accomplished by means of the delicate instruments designed by both Malassez and Gowers for counting the number of red corpuscles in a minute drop of blood, and estimating the amount of hæmoglobin they contain. Dr. Weir-Mitchell insists that there is an intimate association between the gain and loss of fat, and the gain and loss of

red blood corpuscles. He therefore finds those cases in which these usual conditions are reversed, when there is an excessive deposit of fat with a decreased number of red blood corpuscles, very intractable and difficult to treat. He recommends that in such cases the patient should be put to bed, massage should be freely used, and the diet restricted to skimmed milk, or to milk and broth free from fat. When the weight is lowered, iron should be freely given, and by degrees a general diet. The red blood corpuscles will be found under this treatment to have increased in number, and as the weight diminishes strength increases, and health is re-established.

Dr. Weir-Mitchell gives a case of a lady, aged forty-five, 5 ft. 4½ in. high, who weighed 190 lbs. (13 st. 4 lbs.). She was anæmic, feeble, and breathless. "She was kept in bed for five weeks. Massage was used at first once daily, and after a fortnight twice a day, while milk was given, and in a week made the exclusive diet. Her average loss for thirty days was a pound a day, and the diet was varied by the addition of broth after the third week, so as to keep the reduction within safe limits. . . . After two weeks I gave her the lactate of iron every three hours in full doses. On the fourth week additions were made to her diet list, and Swedish movements were added to massage, which was applied but once a day; and during the fifth week she began to sit up and move about. Her weight at the seventh week had fallen to 145 lbs., and her appearance has decidedly improved. . . . Now, after two years, she is a well and vigorous woman."

The reasonableness of dietetic treatment.—This case illustrates the fact that each case should be treated scientifically, intelligently, and on its merits. It is as futile as it is dangerous for the unlearned to prescribe dietetic rules for the ailing, the weak, and the obese. "She wants support," a sympathetic friend will say of a poor invalid suffering from the nausea and weakness of advanced Bright's disease, and will proceed to recommend steak and

port wine, ignorant of the fact that she is thereby increasing the effete products in the blood of the patient, which are the causes of the symptoms remarked. Or another will tell of a great reduction in size brought about in himself by a meat diet and mountaineering, and will unhesitatingly prescribe the same for a fat friend whose pallor and lethargy bespeak a fatty heart and perhaps damaged kidneys. Dietetic treatment is but reasonable medical treatment based on principles or knowledge more scientific and accurate as a rule than therapeutic treatment, and it should be undertaken or prescribed only after a careful study of the causes of the condition complained of.

CHAPTER XIV.

DIGESTION.

In the Stomach.

Having now considered the nature and constitution of the various foods which sustain and build up the body, I will proceed to describe the methods and processes by which they are digested and assimilated.

Digestion of food in the mouth.—When solid food is placed in the mouth, it is masticated or ground by the molar teeth. It is at the same time thoroughly mixed with the saliva, which is poured out in abundance at the moment required, by the salivary glands, the ducts of which open into the mouth on the inner side of the cheeks and under the tongue. The period of time that the food remains in the mouth, subject to mastication and to the influence of the saliva, varies with different individuals ; but it is well that this period should be as long as possible, in order that the food may be completely broken up, and the tougher and harder portions rendered fit for digestion in the stomach. Besides mastication, the first step in the digestion of *starch* takes place in the mouth.

Starch is contained in a great number of the vegetable foods which are common articles of diet—namely, potatoes, flour, peas, beans, etc. In its uncooked condition, it is incapable of digestion by man. It exists in the form of small granules, composed of concentric layers of material. These granules are insoluble in cold water, but on being boiled or placed in hot water their outer envelope bursts, and the contents swell up, the whole forming an opalescent

gelatinous mass. In order that starch may be made perfectly soluble, so as to pass through the coats of the minute blood vessels of the intestines, it is necessary for it to be converted into sugar, and, therefore, one of the most important acts of digestion is the conversion of starch into sugar. This is brought about by the action of a ferment or diastase. Such a ferment or diastase is present in the saliva, and is called *ptyalin*. It acts on the starch contained in the food, and partially converts it into sugar while mastication is going on.

The mouthful of food, having been thoroughly ground by the action of the molar teeth or grinders, and well mixed with the saliva, is rolled into a ball or bolus by the tongue, and passed, by the act of swallowing, to the back of the mouth. It is here seized by the self-acting or involuntary muscles which form the pillars of the throat, and it is passed by their action, and by the rolling upwards and backwards of the root of the tongue over the epiglottis, or trap-door which closes the opening into the windpipe, into the gullet or œsophagus, a long tube which conducts it to the stomach.

Digestion in the stomach.--The stomach is a large, hollow, bag-like organ, larger at one end than the other, and furnished with strong muscular walls which can contract in every direction. It is lined inside with a highly organised mucous membrane. This mucous membrane consists of follicles or glove-like depressions, some of which are simple, others divided or branched. The glands of the stomach are of two kinds,—*mucous glands*, which are lined with large, clear, rounded cells, that almost entirely fill up the central opening of the tube, and *peptic glands*, which contain large spheroidal and finely granular cells. (See Fig. 1.) It is these cells which are supposed to be principally concerned in the secretion of pepsine. The result of the action of the two kinds of glands in the stomach is that a mucous fluid containing pepsine, and called the gastric juice, is abundantly poured out at the moment

of digestion. By means of the slow, continuous, and churning action of the stomach, the food is constantly

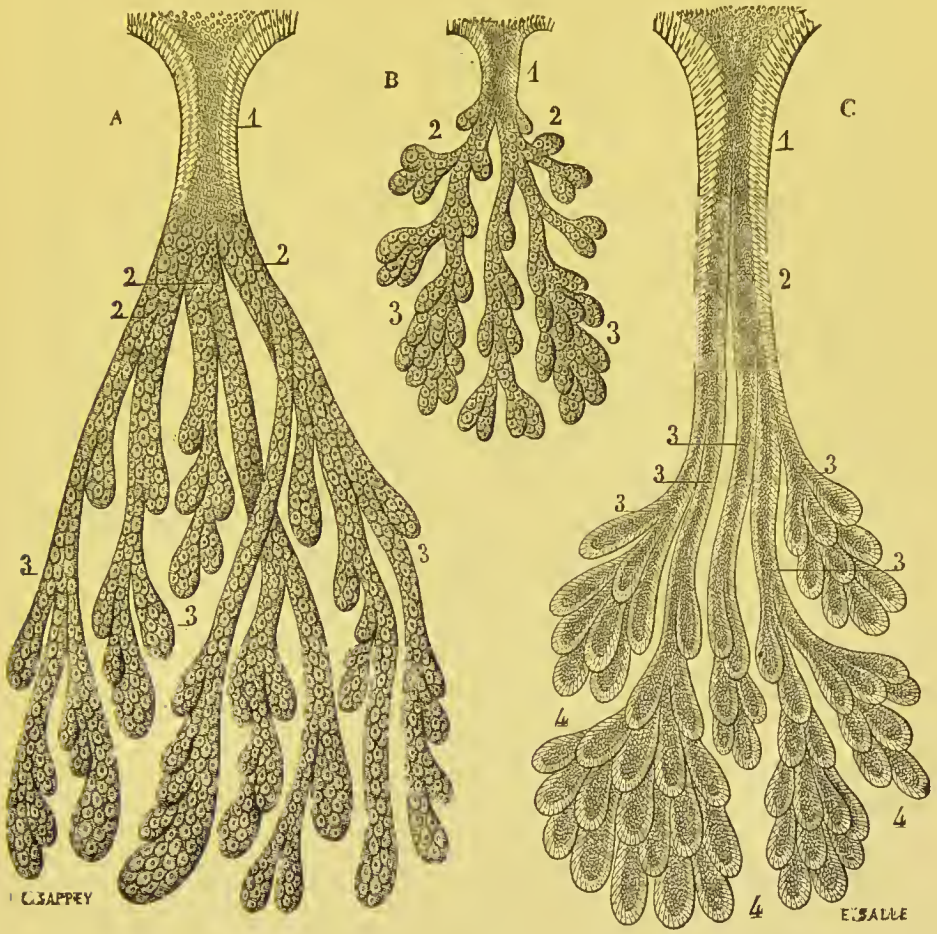


FIG. 9.—THE GASTRIC GLANDS OF MAN.

A. Peptic gland of the middle part of the stomach. 1. Its excretory duct. 2, 2, 2. Its three principal branches. 3, 3, 3. Its secondary divisions, in the course of which are numerous culs-de-sac all of which are filled with spherical cells.

B. Peptic gland of the splenic end of the stomach. 1. Its extremely short duct. 2, 2. Its two principal branches. 3, 3. Numerous culs-de-sac in which they terminate.

C. Mucous gland of the pyloric end of the stomach. 1. Its duct. 2, 2. Its two main divisions. 3, 3, 3. Its secondary divisions. 4, 4. Small racemose glands at their termination.

rolled from one end to the other and becomes thoroughly mixed into a fluid pulp or juice. Unlike all the other

digestive fluids the *gastric juice is acid.* It must be remembered, and it will be found to be very important to bear in mind, when considering later the question of dyspepsia and its treatment by diet, that there are three chief ingredients of the gastric juice, namely, pepsine, free acid, and mucus, all of which are necessary in the process of gastric digestion.

The peculiar quality of the pepsine is that it has the power of digesting and dissolving substances of an albuminous nature; the mucus seems to dilute the pepsine, and to prevent it from acting too violently, even on the coats of the stomach itself, and the free acid—which is hydrochloric acid—is necessary in order to enable the pepsine to act, for it is only in the presence of a free acid that pepsine is operative. Hydrochloric acid has also an antiseptic action, and it stops abnormal fermentation by destroying the numerous bacilli and minute organisms which are swallowed with the food, which if not destroyed would flourish in the stomach and give rise to active fermentation.

The digestion of albuminous substances.—A large part of the food is necessarily composed of albuminous substances. They form, as I have shown, the chief constituents of meat, cheese, milk, and eggs, and are found in many vegetable foods, such as peas, beans, lentils, and also in wheat and oats. In the condition in which albumen is introduced into the stomach it is incapable of being absorbed by the blood vessels. It must, therefore, first be brought into such a condition that it will pass easily through the coats of the veins and be introduced into the circulation. That albumen in its usual condition will not pass through an animal membrane may be proved by placing the white of an egg on a bladder tightly stretched over a vase quite full of water. The white of egg, which is pure albumen, will not pass through the bladder into the water. If, however, some pepsine and a free acid be added, and the whole allowed to stand at a temperature

of about 100 deg., the albumen will undergo such changes that it will pass easily through the bladder, and will be found diffused in the water on the other side. The action of pepsine and the acids of the stomach is such that insoluble albumen is converted into soluble and diffusible albumose; and in this state it passes through the delicate walls of the blood vessels of the stomach, and is conveyed by the portal vein to the liver. Owing to the presence of hydrochloric acid in the stomach the digestion of starch is interrupted as long as the food remains in this organ, for the diastase which converts starch into sugar can only act in an alkaline medium. The digestion of cane sugar is, however, continued in the stomach, where it is converted by the action of the hydrochloric acid into glucose or grape sugar, in which state it is readily absorbed by the blood vessels.

The time occupied by gastric digestion varies from three to four hours. Some articles of food take much longer to digest than others. In arranging the diet of a dyspeptic, it is important to know which foods are most quickly and easily digested in the stomach.

The process of digestion in the stomach being completed, the albumen being turned into soluble albumose, the cane sugar into glucose, and a large part of these substances having been absorbed direct by the blood vessels which ramify on the surface of the stomach, the semi-fluid mass passes gradually, and in small quantities at a time, out of the stomach through the narrow opening of the "pylorus". The pylorus is a small circular passage or opening, which is closed by strong encircling muscular fibres during the process of gastric digestion. If the chyme, or partially digested mass, is thoroughly well mixed, and there are not any large undigested or irritating portions present, the food passes through the pylorus, without any feeling of discomfort. If, however, portions of food are undigested, the pylorus may refuse to let the chyme pass, and the muscles of the stomach, being then

thrown sympathetically into a state of irritation, may contract spasmodically, and the food be ejected forcibly from the mouth by the act of vomiting. If, on the other hand, the stomach has performed its part well, the food passes into the duodenum.

CHAPTER XV.

DIGESTION—(*continued*).

Digestion in the duodenum.—The duodenum is a strong muscular tube, about twelve inches in length (whence the name), which curves round the head of the pancreas or sweetbread. At about the centre of the duodenum will be found the orifices of the tube or duct by which the pancreatic juice is poured into the duodenum ; it here becomes mixed with the chyme or half-digested food contained in the duodenum.

The pancreas is a glandular organ resembling the salivary glands in structure. It is concerned in secreting a fluid, which has the very important parts to play in the digestive process of changing starch into sugar and of emulsifying the fats. It has been already stated that it is necessary for insoluble starch to be converted into soluble sugar before it can pass through the walls of the blood vessels. The first step of this process commences in the mouth by the action of the saliva, but it is here incomplete, and it is stopped altogether as long as the food remains in the stomach owing to the acidity of the gastric juice. The substance called pancreatine, which forms ten per cent. of the pancreatic juice, has the power of almost instantaneously changing starch into sugar. There are various forms of sugar, and the kind of sugar into which starch is changed by the action of the pancreatic juice in the duodenum, is that known as glucose.

Digestion of fat.—We have now seen how albumen, starch and sugar are digested ; but there remains the digestion of one other large and important element of the

FIG. 2.—THE DUODENUM FROM IN FRONT.

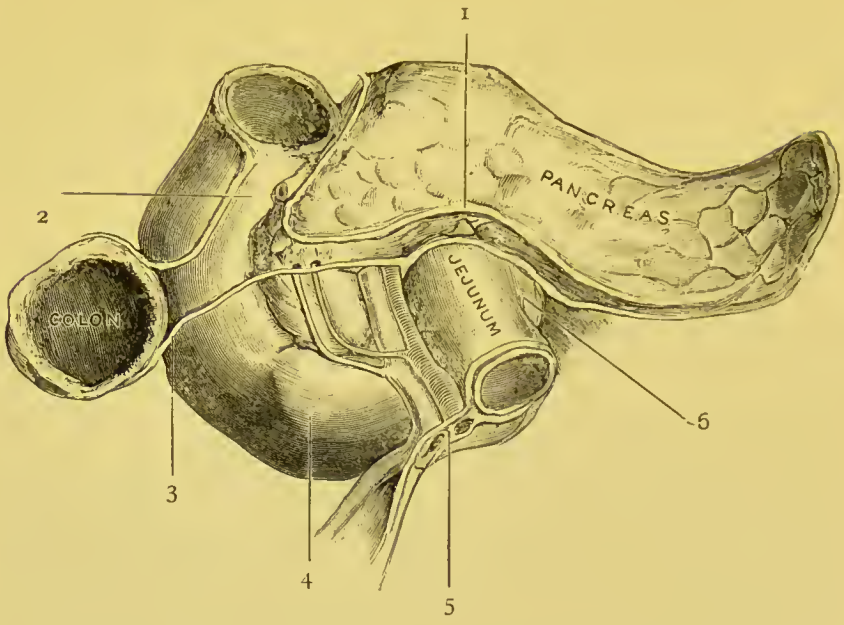
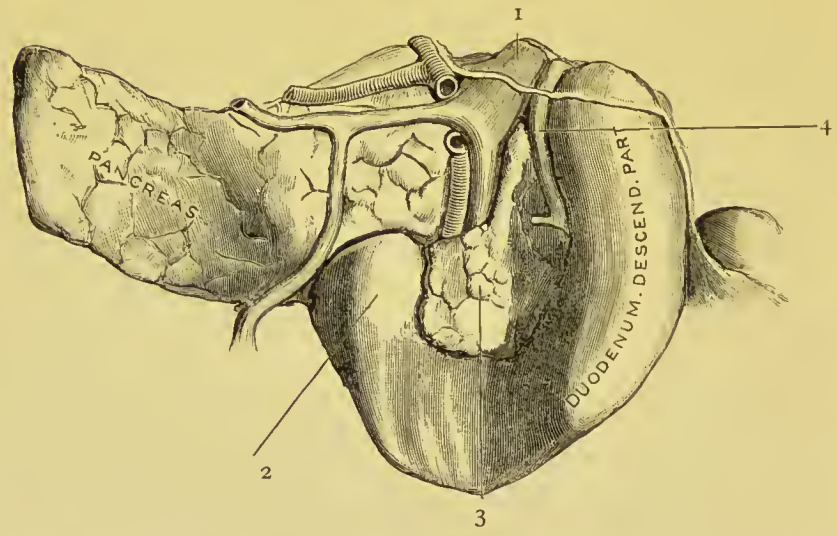


FIG. 3.—THE DUODENUM FROM BEHIND.



WITH FIG. 2.—1. Superior layer of transverse meso-colon. 2. Second part of duodenum. 3. Inferior layer of transverse meso-colon. 4. Third part of duodenum. 5. Superior mesenteric vessels. 6. Fourth part of duodenum.

FIG. 3.—1. The portal vein. 2. Fourth part of duodenum. 3. Head of pancreas. 4. Common bile duct.

food to be described, namely, fat. Fat is not acted upon either by the saliva or by the gastric juices, but the instant it comes into contact with the pancreatic juice in the duodenum it undergoes what is called emulsification. Milk is the type of emulsified fat. If a drop of milk be examined under the microscope it will be found to consist of an immense number of very minute oil globules held in suspension in an albuminous fluid. In "setting the milk" these oil globules, being lighter than the rest of the fluid, rise and form the layer of cream. By the process of churning they are still further separated from the albuminous and other constituents of milk, and form a pure oily substance called butter. In order that the fat foods may be brought into a condition similar to that of milk, in which they can only be absorbed by the lacteals of the intestine, they must be emulsified or broken up into minute oil globules. This is effected by the action of the pancreatic juice, and fat once so emulsified remains in this condition. The digested food in the duodenum is called "chyle," and its reaction is alkaline.

The liver and the bile.—About the level of the orifice of the pancreatic duct in the duodenum is found another small opening, which is that of the bile duct. Through this the bile is poured into the intestine. The bile is produced in the liver. **The liver** is the largest, the most complex, and one of the most important organs of the body. It is lodged in the right side, and fills up a large cavity which is hollowed for it in the base of the right lung, and bounded by the lower edge of the ribs. The liver is composed of large, irregularly shaped, flattened cells, which are closely covered by an exceedingly fine network of blood vessels. One set of these blood vessels is derived from the portal vein, and the blood passing through them contains, as we shall see when considering the question of absorption, a large amount of the products of digestion. The minute final radicles of these blood vessels communicate with another set of radicles, which after ramifying on

the surface of the liver cells, collect into larger branches, and finally form the hepatic vein. The hepatic vein pours its contents into the vena cava or large blood vessel which conducts the blood to the right side of the heart. From this short description it will be seen that the products of digestion are brought into close relation with the liver cells. The bile arises originally in the interstices between the liver cells, and in what are at first wall-less canals; these minute ducts contain an acrid greenish-brown substance, known as the bile. The ducts gradually grow in size as they run together, and they finally pour their contents into a strong muscular tube by which they are conveyed to a hollow sack-like body called the gall bladder. In the gall bladder the bile is stored for future use. At the moment that the food passes into the duodenum the bile is slowly poured out from the bile duct into the duodenum. This discharge of bile continues during the whole process of digestion.

The uses of the bile.—It is allowed on all sides that the bile is a fluid of great importance in the digestive process, but what part it actually plays in this process has not yet been fully ascertained. Of its uses we are more convinced when by some accident, such as the plugging of the bile duct by a stone, or when the flow of the bile is diverted outside the body by an operation, it ceases to be excreted into the duodenum. In these cases when no bile passes into the duodenum the patient or animal emaciates rapidly, and may even die of inanition. As far as we know at present the action of the bile is to emulsify the fats in the food, and to precipitate or throw down from the chyle all the partially digested and undigested particles; it also exercises an antiseptic action on the food-mass in its long passage through the intestines. If the bile is deficient or is withdrawn entirely, the food undergoes putrefactive changes in the intestine, with the production of flatus and putrescent odours.

Digestion in the intestine.—From the duodenum the

food passes into the small intestine. The small intestine measures in the adult male seven and a half yards long. Throughout the whole of this length its internal surface or mucous membrane is closely set with small tubular glands, called the crypts of Lieberkühn. These glands, which are present in countless millions, secrete and pour out into the intestine a watery alkaline fluid. The intestinal juice has, though in a much smaller degree, the same properties as the more active juices of the stomach and

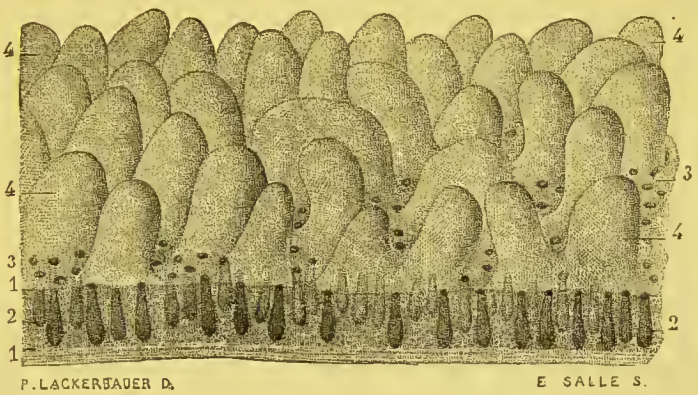


FIG. 4.—TUBULAR GLANDS OF THE SMALL INTESTINE OPENING ON THE SURFACE OF THE MUCOUS MEMBRANE BETWEEN THE VILLI, MAGNIFIED 40 DIAMETERS.

1, 1. A vertical section of the mucous membrane of the small intestine. 2, 2. Tubular glands, their bases resting on the muscular coat, and their mouths opening on the free surface of the mucous membrane. 3, 3. Mouths of these glands. 4, 4, 4, 4. Villi covering the free surface of the mucous membrane: they are here mostly conical, are very large and placed close together.

pancreas. Thus the processes of digestion are continued in a lesser degree throughout the whole tract of the intestinal canal. The albumen which has escaped change into albumose in the stomach, and the starch which has not been converted into glucose by the action of the pancreatic juice in the duodenum, slowly undergo those necessary changes in the intestines.

The presence of food in the intestine acts as a stimulant to its muscular walls, and slow contraction of the involun-

tary muscular fibres of these walls takes place, by means of which a vermiform movement of the intestine is set up, which slowly passes the chyle on towards the large intestine.

The large intestine and its contents.—The opening of the small intestine into the large is by a narrow slit called the ileo-cæcal valve. By the time that the chyle enters the large intestine, its fluid particles and the large amount of intestinal juice thrown out by the crypts of Lieberkühn have been absorbed, and it has assumed a pasty consistence and has acquired an offensive fæcal odour. The fæces contained in the large intestine consist of the indigestible

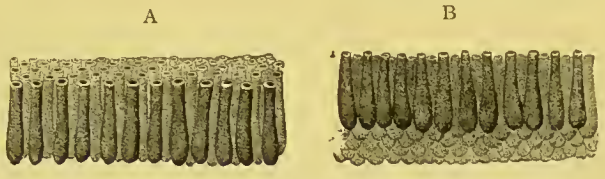


FIG. 5.—TUBULAR GLANDS OF THE LARGE INTESTINE, MAGNIFIED 40 DIAMETERS.

A. Tubular glands seen sideways and from above, showing their substance and their mouths.

B. The same seen sideways and from below, showing their substance and their terminal culs-de-sac.

remnants of the food, and various excretory materials thrown into the alimentary canal during the process of digestion. The undigested substances are the woody and fibrous parts of vegetable food, the elastic fibres and tissues or gristle and the insufficiently cooked parts of animal food. This collection of excrementitious materials, being of no use whatever to the economy, is gradually passed along the large intestine, and is thrown out of the body by the rectum.

CHAPTER XVI.

DIGESTION—(*continued*).

Absorption—Excretion.

Absorption by the veins of the stomach.—The absorption of fluids by the minute radicles of the veins of the stomach is so rapid that in cases of poisoning by hydrocyanic acid, death occurs in a few seconds. There is no doubt that the gastric juice which is poured out in such large quantities during the process of digestion in the stomach is absorbed together with the albumose, the dissolved salts, and the sugar derived from the food. In this way the system is relieved from the excessive drain which would be thrown upon it, if the whole of the gastric juice required for the digestion of a meal had to be manufactured and thrown out anew each time. The absorption of the gastric juice secreted in the process of absorption, in conjunction with the soluble albumoses or peptones, is one of the most important things to remember in the dietetic treatment of dyspepsia; for, if we could succeed, by means of the rapid absorption of fluids by the veins of the stomach, in providing the peptic glands with the material out of which to manufacture pepsine, the digestive process could be immediately aided in cases of atonic dyspepsia.

Absorption from the intestines.—The villi and lacteals.—If a portion of the small intestine of any vertebrate animal be opened, washed, and floated in water, its internal surface will be seen to resemble that of velvet, and to be covered with a countless number of minute projections, or *villi* (Fig. 6). I have already stated that the mucous membrane of the small intestine consists of a vast number of

tubular depressions or glands. It is between these glands and on their edges or surfaces that the villi of the intestine project. It will thus be seen that the area of the internal wall of the intestine is enormously increased by the alternate dippings and elevations of its surface. The part which folds in or dips, forming the tubular glands, is concerned in secretion, and the part which is elevated, forming the villi, is concerned in absorption. The construction of a villus is as follows (Fig. 6): In the centre is found an inverted tube or canal, closed at one end, the walls of which are formed of thin transparent epithelial cells ; this is the blind end of a lacteal. Closely covering it is a fine network of extremely small blood vessels. The external surface of the villus is lined with a single layer of columnar epithelial cells closely set together.

Absorption of fat by the lacteals takes place in the following manner : The minute globules of fat which have been emulsified by the action of the pancreatic juice, the bile, and the intestinal juice, pass through and between the epithelial cells which form the outer lining of the villus, and also through the transparent thin wall of the lacteals. The lacteals communicate with a fine network of lymphatic vessels which ramify on the surface of the mesentery, or membrane to which the intestines are attached. Along these vessels, which are abundantly provided with valves to prevent a backward current, the oil globules, absorbed from the digested food, slowly pass, till gathered into a larger vessel called the thoracic duct. This duct passes upwards beside the vertebral column, and pours its contents into the left jugular vein in the neck.

Absorption by the capillary blood vessels of the intestine is, however, much more important than by the lacteals. It is seen from the structure of the villi that there is only a single layer of epithelial cells intervening between the digested fluid food in the intestinal canal and the extensive surface of the capillary vessels. Absorption, therefore, of all solvent and fluid matters from the intestine into the

veins of the villi takes place easily and rapidly. The intestinal juice which is poured out in such abundance during digestion is also re-absorbed by the blood vessels of the villi.

FIG. 6.—ARTERIES AND VEINS OF THE VILLI, INJECTED AND MAGNIFIED 100 DIAMETERS.

1, 1, 1, 1, 1. Cylindrical villi receiving one single voluminous vein which occupies the centre of it, and several very small arteries all of the same calibre, arranged around the venous trunk with the divisions of which they anastomose at their ends. 2, 2, 2, 2. Flattened villi receiving two venous trunks which communicate with each other by numerous branches, and several arteries which terminate in the extremely rich network formed by these branches. 3. A larger and more flattened villus receiving three venous trunks which by their branches and anastomoses form at its summit a very close network. Around these trunks and in their interspaces very small and pale arterioles are seen which are connected with this network.

The portal circulation.—The blood, now laden with the products of digestion, passes from the venous capillaries of the stomach and intestines to the blood vessels of the

mesentery. These pour their contents into a large vessel called the portal vein, which conducts the blood direct to the liver. It will thus be seen that by this arrangement the albumose derived from albuminous foods, the glucose derived from the starch and sugar, together with the various salts held in solution, are carried direct to the liver by the portal vein, there to be elaborated into the substances necessary for nutrition. The glucose is converted by the action of the liver cells into glycogen, and is, it is asserted, ultimately restored to the circulation in the form of glucose, to be probably burnt up in the tissues in the processes of metabolism or tissue change. The albumose is, after passing through the liver, returned to the circulation in the form of blood albumen.

Most of the fatty particles of the food are absorbed by the lacteals, and enter the general current of the circulation by the thoracic duct, which pours its contents into the left jugular vein. The jugular vein leads into the superior vena cava, which conducts the blood to the right side of the heart, from which it is pumped by the pulsation of the heart into the lungs. In the lungs the fatty particles with which the blood is charged after a meal entirely disappear, and are probably burnt up in the process of the maintenance of the body heat.

The blood is charged with the elements of tissue change.—Thus in passing through the two great separative and constructive organs of the body, the lungs and the liver, the venous blood, charged both with the products of decomposition (carbonic acid gas), and with the materials for repair, undergoes such changes by casting out the products of tissue destruction, and by modifying the materials of reconstruction, that it issues both from the lungs and the liver in a renovated condition, and charged with those materials which are necessary for the growth and repair of the tissues.

The blood, as it issues from the lungs, is carried by the pulmonary artery, and as it issues from the liver by the

hepatic artery, into the aorta, and is then conveyed by the circulation into the furthermost parts of the body, where it nourishes the tissues. But the lungs and the liver have not done all that is necessary for the scavenging and renovation of the blood. After leaving the liver it passes all through the tissues, is again collected by the veins, and passed on to the right side of the heart. It is thence pumped into the lungs, where it parts with its carbonic acid gas, and receives a new and revivifying supply of oxygen. Passing again into the heart, it is pumped from the left ventricle into the aorta, thence to be distributed to the body. But though apparently cleansed by its passage through the lungs, it is still laden with the products of decomposition, of incomplete oxidation, or retro-

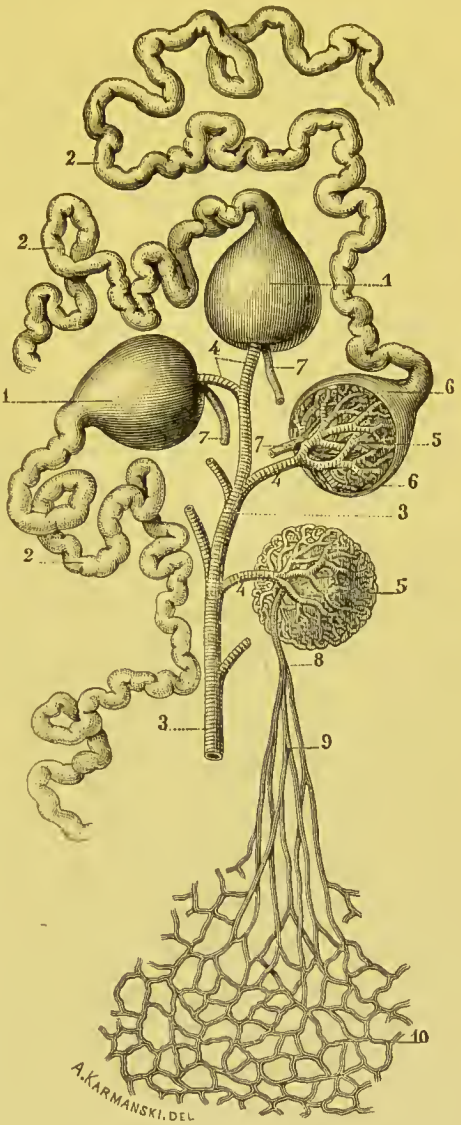


FIG. 13.—GLOMERULI OF THE KIDNEY; ORIGIN OF THE URINIFEROUS TUBULES.

1, 1. Glomeruli surrounded by their capsules, or the funnel-shaped terminations of the uriniferous tubules. 2, 2, 2. Uriniferous tubules springing from the capsules and much contorted in their course. 3, 3, 3. The interlobular branch of the renal artery. 4, 4. Its branches or the afferent vessels of the glomeruli. 5, 5. Two glomeruli in which are convoluted the afferent vessels. 6, 6. Glomerulus with the capsule partly removed. 7, 7. Efferent vessels of the glomeruli. 8. Efferent vessel the branches of which, 9, break up into the capillary network of the kidney, 10.

gressive changes which have taken place in the tissues in the course of tissue change or growth, and in the production of energy. These effete products are more particularly those which result from the incomplete oxidation of albumen, and they are found in the blood in the form of urea and uric acid. As these substances are most deleterious in their effects, and even poisonous in their action if allowed to circulate in the blood, it becomes a matter of the greatest importance to get rid of them. This is accomplished by the action of the kidneys.

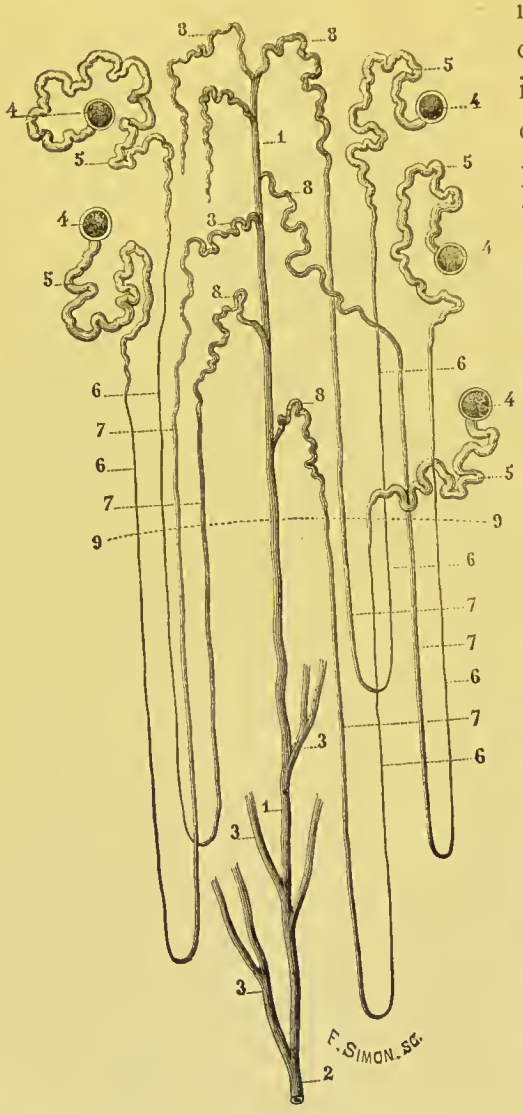


FIG. 14.—COURSE OF THE URINIFEROUS DUCTS, DIAGRAMMATIC PLAN.

1, 1. Rectilinear uriniferous tubule; a collecting duct passing from the periphery of the lobes towards the papilli of the kidney towards which it opens. 2. Lower end of the tubule, which has been cut off a little above its mouth for the convenience of the drawing. 3, 3, 3. Other collecting tubules opening into the cavity of the preceding. 4, 4, 4, 4, 4. Malpighian bodies or glomeruli. 5, 5, 5, 5, 5. Contorted tubules springing from the glomeruli and forming the greater part of the cortical substance of the kidney. 6, 6, 6, 6, 6. Straight tubes succeeding the contorted tubes and descending from the cortical into the medullary substance. 7, 7, 7, 7, 7. Larger branches forming loops. 8, 8, 8, 8, 8. Other ascending branches.

The kidneys are two bean-shaped bodies, which lie at the back of the abdominal cavity, on either side of the

vertebral column in the lumbar region. The arteries which conduct the blood to them come off at right angles to the aorta, from which arrangement it is obvious that the blood passes with considerable force into the kidneys from the main channel of the circulation. Within the kidneys the artery at once divides into a number of vessels which end in what is called a glomerulus. In the glomerulus the vessel breaks up into a great number of finer vessels folded one upon another in a tangled ball. The arteriole communicates with a vein similarly constructed and arranged, but of smaller calibre. It is apparent from the arrangement that the return of the blood from the glomerulus must be somewhat hindered. This convoluted ball of blood vessels is pushed into the globe-like distension of a fine tube. (Fig. 7.) The delicate transparent double walls of the sack-like end of the tube envelop the glomerulus on every side. Here we have all that is necessary for the process of filtration: namely, blood carried at high tension from the full current of the circulation suddenly brought almost to a condition of stasis in the tangle of the glomerulus, and a bag or filter furnished with a conducting tube in immediate contact with the distended blood vessels. What happens is that the watery constituents of the blood, together with the urea and other extractive and colouring matters, are filtered from the capillary vessels into the sack-like termination of the uriniferous tubule. In a state of health the albumen and fibrine of the blood do not pass this filter. The urine thus excreted from the blood in the glomerulus passes by a series of looped vessels into a single tube which opens into a basin-like cavity called the pelvis of the kidney. The fluid which is being constantly forced out from the uriniferous tubules is finally conveyed from both kidneys by long, narrow, muscular tubes called the ureters to the bladder, which is emptied at will.

To recapitulate.—I.—1. Starchy foods are converted into glucose in the mouth by the action of the saliva, and in the duodenum by the action of the pancreatic juice.

2. Albuminous foods are converted into soluble albumoses or peptones by the action of the pepsine of the gastric juice acting in an acid medium, and by the trypsine of the pancreatic juice acting in an alkaline or neutral medium.

3. Fats are emulsified in the intestines by the action of the pancreatic juice, the bile, and the intestinal juice.

II.—1. Albumose is absorbed by the venous radicles of the stomach and intestines, and carried by the portal vein to the liver.

2. Glucose is absorbed by the capillaries of the villi, and carried by the mesenteric veins to the portal vein, and thence direct to the liver.

3. Emulsified fats are absorbed by the lacteals, and are carried by the thoracic duct to the left jugular vein.

III.—1. Albumose is converted by the liver into albumen, and is present in the blood in the form of blood serum and fibrine.

2. Glucose is converted by the action of the liver into glycogen, and is stored there for use in the economy.

3. Fats are burnt off in the lungs and in the tissues in the production of body heat. Fat is also stored up in the tissues for future use.

The various digestive juices are re-absorbed during and after the process of digestion.

The excretory products of digestion are the bile, excreted by the liver; the urine, containing urea, excreted by the kidneys; and the fæces, containing the indigestible and undigested remnants of food, broken-down cells, masses of bacilli which flourish in the intestine, and the colouring matters of the bile.

Any abnormal divergence from the long and complicated process of digestion will give rise to many conditions of ill-health and disease, to dyspepsia, gout, diabetes, etc.

CHAPTER XVII.

INDIGESTION.

HAVING described the various foods used by civilised man, and the processes in the human economy by which these foods are digested, I propose now to consider the deflections from the normal in the long and elaborate process of digestion, and the treatment or rectification of these abnormal conditions by diet. In treating, however, of the question of dietetics I do not intend to simply state the foods which must be avoided or which may be allowed, but also to arrange daily *ménus* for the patient and to give practical instructions how the dishes are to be prepared. Dyspepsia, diabetes, gout, Bright's disease, etc., their physiological causes, and their dietetic treatment, will be taken in order ; and I trust to be able to make it plain that a suitable dietary and an intelligent cook are more valuable to patients suffering from these complaints than all the drugs of the pharmacopœia.

Indigestion is the most universal of complaints. It afflicts alike the rich and the poor, those who eat too much, and those others who eat too little ; the idle and the busy ; the young and the old. When, however, the length and the complication of the process of digestion are considered, and when it is remembered that the slightest deflection from the normal will cause pain and discomfort, it is not surprising that indigestion is such a common complaint ; still less so when it is borne in mind that in order to please the palate by agreeable flavours and sensations, the average civilised man in well-to-do circumstances taxes the long-enduring powers of digestion to the very utmost. The

organs concerned in the process of digestion are the mouth, the stomach, the liver, and the pancreas; disturbance or impaired action of one or any of these may be the cause of indigestion.

Causes of indigestion: in the mouth.—The food may be insufficiently masticated, owing to the teeth being decayed or deficient. If the food remains too short a time in the mouth it is not properly ground into a pulp by the grinders, and is not sufficiently mixed with the saliva. If introduced into the stomach in an unmasticated condition, the food takes a much longer time to be broken up by the action of the muscular movements of the stomach and submitted to the action of the gastric juice. The saliva, being alkaline, stimulates the secretion of the acid gastric juice, and thereby exercises a considerable influence in quickening and aiding digestion; it is therefore important that the food should be well mixed with saliva before being swallowed, and that those who have a tendency to indigestion should masticate their food slowly and thoroughly.

In the stomach.—The most important part of digestion takes place in the stomach. Here the food is thoroughly triturated by the movements of the muscular walls of the stomach, and mixed with the mucus and gastric juice poured out from the glands of the stomach; the albuminoids are acted upon by the pepsine, and absorbed by the veins of the stomach in the form of albumose. The most frequent cause of stomachal indigestion is chronic gastritis. In this malady the mucous membrane of the stomach is subject to frequent attacks of subacute inflammation, with the result that the peptic glands become atrophied, their cells are degenerated, while the mucous glands become hypertrophied. The consequence is that the gastric juice is deficient in quantity and poor in quality, while mucus is secreted in excess. When this malady is once firmly established, it is very difficult, if not impossible, to cure. The mucous membrane of the stomach may be, however,

in a condition anatomically healthy; in this case the indigestion may be caused by irregular nervous action, or by

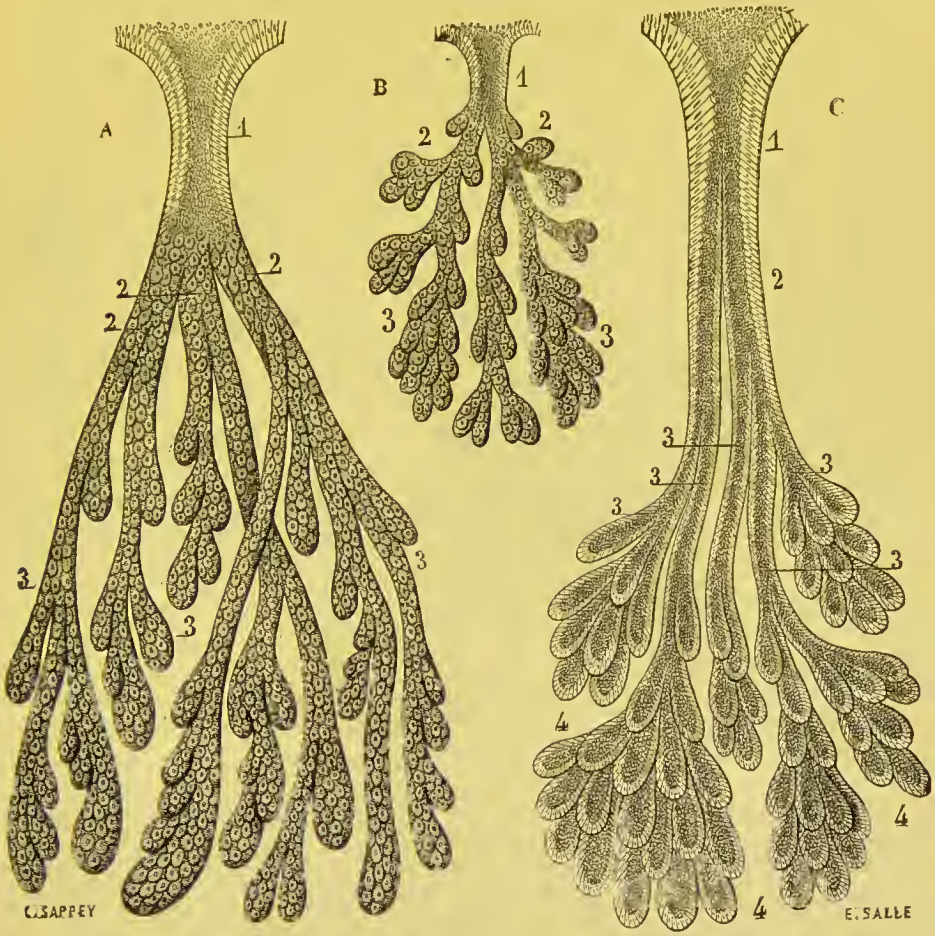


FIG. 9.—THE GASTRIC GLANDS OF MAN.

A. Peptic gland of the middle part of the stomach. 1. Its excretory duct. 2, 2, 2. Its three principal branches. 3, 3, 3. Its secondary divisions, in the course of which are numerous culs-de-sac all of which are filled with spherical cells.

B. Peptic gland of the splenic end of the stomach. 1. Its extremely short duct. 2, 2. Its two principal branches. 3, 3. Numerous culs-de-sac in which they terminate.

C. Mucous gland of the pyloric end of the stomach. 1. Its duct. 2, 2. Its two main divisions. 3, 3, 3. Its secondary divisions. 4, 4. Small racemose glands at their termination.

an unhealthy condition of the blood. The gastric juice may then be secreted in excess, giving rise to "acidity," or

it may on the other hand be secreted insufficiently, causing slow and difficult digestion of the albuminoids. The gastric juice may also contain either too little or too much acid. In the first case, the pepsine is slow and uncertain in action; in the second, digestion may be too rapid. These irregu-

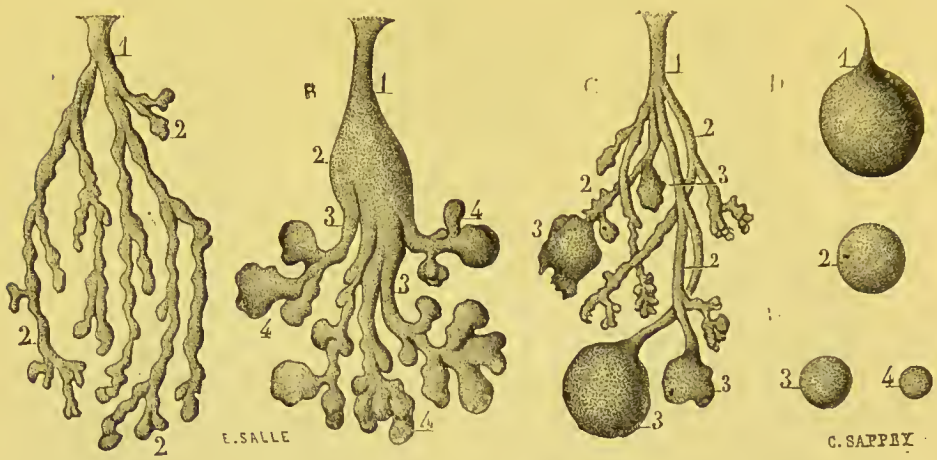


FIG. 10.—GASTRIC GLANDS OF MAN IN A MORBID CONDITION.

A. Atrophied peptic gland containing no longer spherical cells, but only a small quantity of fluid. 1. Its duct. 2, 2. Its branches, the calibre of which is reduced, and the outline very irregular, the culs-de-sac hollowed along its course have almost entirely disappeared, and are only represented by very small swellings of uncertain form.

B. Another peptic gland from the splenic region, of which the duct, branches and culs-de-sac are on the contrary dilated. 1. Free end of the duct which is not dilated. 2. Lower end of the same dilated like a bottle. 3, 3. Its branches slightly dilated. 4, 4. Terminal culs-de-sac filled with fluid and inclined to be cystic.

C. Peptic glands the divisions of which are atrophied; three of these divisions terminate in actual cysts. 1. Duct of the gland. 2, 2, 2. Its different branches. 3, 3. Dependent cysts.

D. Cysts of various diameters which float here and there in the fluid of preparation, and which were wrongly considered by anatomists to be closed follicles. 1. Cyst detached from the gland to which it belongs, carrying with it a part of its pedicle. 2, 3, 4. Other smaller cysts, the pedicles of which have been broken off at the point of insertion.

larities, in the secretion and condition of the gastric juice, may be due to the want of proper nervous control of the minute blood vessels which feed the peptic glands, or to abnormal conditions of the blood, as in fevers, anæmia, diabetes, etc. Stomachal indigestion may be also caused

by slow, sluggish movements of the muscular walls of the stomach, or by too rapid and energetic movements which cause the food to be ejected into the duodenum before it is thoroughly broken up and submitted to the action of the gastric juice.

It will be seen from the foregoing that **the causes of indigestion in the stomach are many and various,** hence the extreme difficulty of treating this complaint on any well-defined rule. The symptoms may be the same, but the causes are different, and the disease must consequently be differently treated. In one case alkalies are indicated ; in another, hydrochloric acid gives relief : in one, food must be taken at frequent intervals ; in another, long periods of rest must be given : in one, fluid food can alone be borne ; in another, the meals must be taken without drinking. The stomach has, moreover, many idiosyncrasies and antipathies which are either constitutional and permanent, or functional and temporary. Thus one person cannot digest strawberries, another cannot take onions ; one person cannot eat shellfish, and to another mushrooms will give an attack of indigestion. The dietetic treatment of stomachal dyspepsia can therefore be only correctly arrived at by experiment based on certain well-known principles ; in fact, each dyspeptic must discover for himself what he can eat, how much, and how often.

The principle of treatment by dietetic rest.—I am convinced that indigestion need not be such an universal complaint if people would treat their bodies in the same way as they treat their employees, and make them work hard on the lowest possible wage, with proper periods for rest. Abstemiousness and physiological rest are, in my opinion, the initial principles involved in the successful treatment of gastric dyspepsia. If the indigestion is caused by want of nervous tone, give the stomach only as much food to digest as will maintain strength ; if it is caused by alcoholic excess, cut off all wines and spirits ; if caused by irregularities in the production and quality of the gastric

juice, rest the stomach as much as possible till nature effects her own cure. The doctrine of rest is not sufficiently considered in treating derangements of the stomach. If we have a sore and excoriated skin wound, we take care to rest the part so as to let healthy granulation go on undisturbed. The mucous membrane of the stomach may be considered in acute forms of dyspepsia to be in much the same condition, and its cure would be better accomplished by rest than by anything else. Such rest could be partially obtained by taking predigested and fluid foods. Unfortunately, however, the practice of the dyspeptic is generally the opposite. Finding the appetite fail, and thinking it the most important of physical duties to eat, he tempts appetite and stimulates a fatigued and jaded stomach by highly spiced foods and by dainty dishes, thus often rendering chronic a condition which might have been only temporary. "Why do you come to Carlsbad?" I once asked a visitor who was a well-known diner-out in London society, and who by his air of general well-being did not seem to need a "cure". "Because," was the reply "it enables me to eat what I like for the rest of the year.' This is an example of what I mean by curing dyspepsia by means of resting the stomach. The plentiful ablutions of the mucous membrane, and the rigid abstemiousness of life and diet insisted upon at Carlsbad and other spas, give the stomach the chance and opportunity of curing its dyspepsia by rest.

Duodenal indigestion.—After the food has been acted upon by the gastric juice in the stomach, and the albuminoids have been in a great measure rendered soluble and absorbed, the acid chyme passes into the duodenum, where it is acted upon by the bile and the pancreatic juice, both of which are alkaline. The *rôle* of the bile is to emulsify the fats, and of the pancreatic juice to turn the starch into glucose. The bile is secreted by the liver, and it is rightly thought that the liver plays a large part in causing indigestion. If the bile is deficient there is constipation and

often distressing flatulence ; if it is secreted in excess the bile salts are not re-absorbed, but circulate in the blood, producing great depression of spirits. The bile may also regurgitate into the stomach, causing vomiting of a very acrid substance. If the pancreas fails to fulfil its part, the starchy foods are not converted into glucose, the process of digestion is not completed, and undigested food passing down the alimentary canal causes irritation and diarrhœa, and the patient emaciates.

The symptoms of indigestion.—In those in whom the process of digestion is normal, eating gives only a sensation of satisfaction. The food passes from the stomach into the duodenum without exciting any uncomfortable feelings, and the person goes about his occupations untroubled by the cares of the body till hunger tells him it is time to eat again. Not so with the dyspeptic. Eating gives at first the sense of satisfaction ; but this is soon followed by a feeling of distress at the pit of the stomach. The waist seems and is unnaturally distended, eructations of flatulence take place, the stomach feels sore inside, pain spreads to the region under the shoulder blades, the intelligence becomes dulled, the temper irritable, the spirits depressed, and there is a tendency to drowsiness, the indulgence in which is at once the temptation and the refuge of the dyspeptic. That a person is suffering "only from indigestion" is often thought to be a reason for expressing no sympathy with his malady ; but, in my opinion, there is no condition which is more worthy of our pity ; in fact, a severe illness is, I think, much more endurable than the daily constant miseries of the dyspeptic. The healthy can scarcely realise what he suffers : the discomfort which does not amount to pain, the depression which does not reach melancholia, and the nervous irritability, the manifestation of which makes him shunned by his friends. While he wants to dine he dreads to eat ; when he longs to be cheerful he feels in the depths of low spirits ; when he wishes to be kind he cannot help being cross. He is an un-

fortunate—to be pitied, to be borne with patiently, and to be helped ; but first of all he must help himself. He must make his own condition, his tiresome, contradictory, ill-regulated stomach, his study, and must discover what to eat and what to avoid, and having discovered the rules by which to govern himself he must abide by them.

Doctors, to whom dyspeptics go for treatment and advice, are fond of giving their patients written or printed lists of the things they may eat and not eat, the time for meals, etc. This rule of thumb may answer fairly well with a mass of people, but it is scarcely intelligent or scientific. These lists, and even the prescriptions, are handed on from one dyspeptic to another in the hope that the talisman may act without the payment of the standard fee. The results of this haphazard method of treating a most complicated malady would afford comic reading if they could be collected, and might doubtless form the bases for many miraculous cures. Asking once for something requiring immediate attention to be made up for me at a well-known chemist's, I was informed that it could not possibly be done that day, as the Countess of —— was going away into the country, and had sent all her prescriptions to be made up —they being always carefully preserved by her for country dispensation to her poor neighbours and dependants.

I cannot resist the temptation to tell the following story, illustrating the way in which dietetic rules for the treatment of indigestion are handed on and looked upon as infallible specifics. Four men, unknown to each other, once met at the common table of a country inn. They all paid evident attention to what they ate. One refused the soup, and remarked, "Sir A. B. forbids soup at dinner ;" another objected to drink anything, saying, "Sir A. B. advises that the meals should be taken dry." A third rejected the entrées and sweets, and sighed pathetically, "All kickshaws are tabooed by Sir A. B.". The fourth man, however, was observed to eat steadily through the dinner, and to partake of all the good things with evident relish. "Sir," at last

said one of his companions, "you do not seem to follow the dicta of Sir A. B." "No," was the genial reply of the man who had enjoyed his dinner, "for I am Sir A. B." I once had the audacity to tell this story to the great physician indicated, and no one's amusement could have been greater or his laughter more hearty.

To treat dyspepsia dietetically there are certain broad principles to be followed. First, the bowels should be regulated with care, watchfulness and intelligence. Both constipation and diarrhœa should be avoided. It is of the utmost importance that, on the one hand, the digested food should not lodge or stagnate in the intestines, there undergoing fermentative changes and causing flatulence and distress; nor, on the other, should it be hurried through the intestines without the opportunity for proper assimilation. Constipation is sometimes caused by the patient taking food which is too easily digested, so that the peristaltic action of the intestines is not excited by the presence of undigested morsels. In these cases vegetables will often effect a cure. A glass of water taken on rising will have, in many cases, both a tonic and an aperient effect. Chronic diarrhœa can be often checked by taking the most easily-digested food and raw meat juice, the preparation of which is described in the chapter on invalid foods. It is incorrect to think that constipation and diarrhœa can only be cured by pills and draughts; a careful dietary can do more to establish a healthy condition of the intestinal mucous membrane than the use of drugs.

In cases of atonic dyspepsia, caused by want of nervous tone, the meals should be small and frequent, if they can be well borne. The period of time between meals necessary to digest each meal properly can only be ascertained by experiment in the case of each patient individually. It is the greatest possible mistake for a dyspeptic to force himself to eat. If he is not hungry, it is probably because gastric juice has not been secreted in sufficient quantity to enable him to digest a meal. An attack of indigestion

will therefore probably follow if food be taken. The reasonable thing to do is not to oblige the patient to eat when he has no appetite, but to give him the material out of which the stomach can manufacture the pepsine required to perform digestion. This can be done by giving a small cupful of beef-tea half an hour before the meal. The beef-tea is rapidly absorbed, a stimulus is given to secretion, and the gastric juice is produced and poured out in time to digest the subsequent meal. This rational treatment of indigestion was discovered by the physiologist Schiff. It is too little known and practised.

In all cases of indigestion the meals should be simple ; that is, composed of few dishes ; and one or two things only should be eaten at the same time. Thus, a dyspeptic may, perhaps, eat a cut of roast beef with comfort ; but if he heaps his plate with potatoes, green vegetables, and Yorkshire pudding, and eats them altogether, he will infallibly suffer from flatulence and indigestion. It would be better for him to eat his vegetables at one meal and his beef at another. It is better also to drink between meals, and not at meals. To make this a habit is, in some cases, alone sufficient to cure obstinate dyspepsia. Pastry, mysterious concoctions of preserves and flour, rich, greasy, and highly spiced and flavoured foods should, as a rule, be avoided by the dyspeptic. It is most important, however, that the food should be well cooked and daintily served, and that variety should be studied. "By variety," says Dr. King Chambers, "is meant not a great number of dishes at once, which is confusing and oppressive, and destructive of the object aimed at ; but a frequent (why not daily ?) difference in the principal dish, to which the few other dishes are harmonised. Some of the most appetising dinners one has ever eaten have really consisted of one article, novel and unexpected. The famous Mrs. Poyser sagely remarked that a man's stomach likes to be surprised, and no surprise is possible if the same monotonous superfluity is repeated day by day."

In the intelligent combination of simplicity with variety, and of good cooking with both, lies the secret of the power to relieve much of the discomfort of the dyspeptic.

Whether alcohol should be taken or not is a subject again for experience. In many persons whose dyspepsia is the result of sedentary life and too constant an application to anxious work in close rooms, a small amount of alcohol with meals undoubtedly promotes digestion ; if, however, it causes flushing of the face and throbbing of the arteries it should not be taken. Good whisky or brandy well diluted is often better borne than fermented wines. Tea acts on some dyspeptics like poison, producing a sense of weight in the chest, palpitation of the heart, and nervous excitement. If taken weak, and if the tea leaves be removed three minutes after the tea is made, it can be digested and has a refreshing and invigorating effect. Sugar should be taken sparingly by persons over forty ; vegetables should be cooked well and in a variety of ways.

Probably the best of all cures for dyspepsia is fresh air. I am acquainted with chronic and constantly suffering dyspeptics who lose their dyspepsia as if by magic on going on board ship and sailing across the ocean. High, dry, bracing, sunny climates are the best, in which outdoor exercises, such as riding and golfing, can be enjoyed. Cheerful society should be sought, and even "frivolous conversation" is recommended by Dr. King Chambers at meals. Perhaps our forefathers had better judgment than ourselves when they enjoyed the jokes of the jester after a banquet, instead of listening to the solemn perorations of the speech-makers.

To consider his dyspepsia scientifically and philosophically, to study it, to lay down rules for his own guidance, to follow them, and then, as far as possible, to forget his malady, should be the aim and practice of the dyspeptic.

CHAPTER XVIII.

INVALID FOODS.

THE preparation of food for those who are seriously ill is a matter of vital importance, for the life of the patient often depends either on the maintenance of strength during the acute period of the disease or on the recovery of power during convalescence. In acute illness and in high fever the stomach is unable to digest solid food. It becomes, therefore, of great importance to administer food which is not only highly nutritious, but which contains the food principles necessary for the maintenance of strength and the repair of the tissues wasted in the fever process.

Patent foods often of little value though of high price.—It is only of recent years, however, that the feeding of the patient has been based on scientific principles, and that doctors have turned their minds to such subjects as the correct making of beef-tea and gruel. Even now, unfortunately, the provision of food for the well-to-do is entrusted too much to the vendors of patented and secret preparations; and we are left in ignorance of the actual constitution of the foods for which we are paying a high price, in the hope that they contain the necessary elements. In this we may be, however, entirely deceived, and many of the patented beef-teas and meat-juices which are purchased at great cost, in the belief that they are "strengthening," contain only a trace of albumen. The expensive preparations of malt also advertised as "foods" cannot be properly included in this category.

Invalid foods can be well prepared at home.—My object will be to show how the most nutritious invalid foods

can be prepared at home, in the sick-room, and at the least cost. I have, when attending on the sick, been frequently struck by one of two things—either the immense cost at which the patient was being nourished on patent foods, or the small amount of nourishment which was extracted by means of ignorant methods from good materials. If the nature of the food principles necessary for the maintenance of the body be remembered, and also the broad facts of digestion, beef-tea, jellies, etc., would be made with much more intelligence, and the invalid would be better fed. Having, in the previous chapters of this book, given some account of food values and of the processes of digestion, I will proceed to describe how the invalid may be intelligently fed, without resorting to costly patented foods of unknown composition, and I will give recipes which may be safely followed.

Beef-Teas and Beef-Juices.

Beef-tea—methods of making.—1. Remove all the fat and skin from one pound of fresh gravy beef; cut it up in small pieces, and put it in a stone jar with a pint of cold water and a little salt. Replace the lid of the jar, and let it stand all night. The next morning place the jar in a saucepan of boiling water, and let it simmer gently, but never boil, for five hours. Strain the fluid from the beef through a colander.

It must be borne in mind that beef-tea made in this way is, as well as the patent beef-teas and beef-juices, not a food in the true sense of the word, but rather a stimulant. Such beef-teas contain little or no albumen, and only a very slight amount of gelatine, but they hold in solution the sapid extractives and salines of the meat. The universal experience, however, is that beef-tea is to the sick and weak a valuable restorative, though it must never be forgotten that it is not nourishing.

2. **Whole beef-tea.**—Make the beef-tea as in the previous case, but instead of throwing away the residue of the

meat, pound it in a mortar into a pulp, pass it through a wire sieve and add it to the beef-tea. The beef-tea made by this method is thoroughly nutritious, as all the fibre and albumen of the meat are contained in it.

3. **Peptonised beef-tea** (Sir William Roberts' recipe).—Mix half a pound of finely minced lean beef with half a pint of water and 20 grains of bicarbonate of sodium. Let it simmer for an hour. Remove from the fire, and when it has cooled down to a lukewarm temperature add a tablespoonful of *liquor pancreaticus*.[1] Then set the mixture aside for three hours, wrapped in a tea cosy or flannel to maintain the temperature, and occasionally shake it. At the end of this time decant the liquid portion and boil it for a few seconds. Boiling stops the process of digesting, which should not be allowed to go beyond a certain point, or otherwise the beef-tea becomes bitter and unpalatable.

Beef-tea prepared in this way is as rich in albuminates as milk. When seasoned with salt it is scarcely distinguishable in taste from ordinary beef-tea. By being partly predigested it is eminently suitable for invalids whose digestive organs are in a much weakened condition. Care should, however, be taken not to continue the use of predigested foods too long after the stomach has begun to recover tone, else that organ becomes demoralised, and may lose the power of normal digestion.

4. **Raw meat-juice** (Dr. Cheadle's recipe).—To one part of best rump steak finely minced add one fourth the amount of cold water. Stir well together, and allow the beef to soak for half an hour, then place the whole in a piece of muslin or cambric, and forcibly express all the juice by firm twisting.

By this method a highly nutritious and nitrogenous food

[1] Liquor pancreaticus is made from beef pancreas. Pancreatine has, like pepsine, the power of digesting albumen and turning it into soluble albumose. The preparations of pancreatine are much more reliable than those of pepsine. Zymine is also a most useful preparation, and food is rapidly peptonised by it.

is obtained, containing no less than five per cent. of albumen. In Dr. Cheadle's opinion raw meat-juice is the most easily digested and restorative of all animal foods, and the most valuable of all nitrogenous preparations for children.

5. **Beef balls raw.**—Scrape with a knife all the juice out of a fresh rump steak, leaving nothing but the fibrous tissue behind. Mix with cream and roll into balls. Heat a baking tin very hot, and roll the balls rapidly over the hot surface. Sometimes a drop of cherry brandy is added to each ball to mask the flavour; but I have found that rolling the balls over a hot tin and the addition of cream will take away both their objectional appearance and raw flavour, while the condition of rawness remains really unaltered. This is a very valuable food in acute gastritis; also in gastric catarrh, when solid food is ill tolerated.

Malted Foods.

We have seen that in the digestion of starch, it is acted upon by a diastase which is contained both in the saliva and in the pancreatic juice, which diastase converts starch into glucose or grape sugar. Malt has at a certain heat the same effect on the starch contained in wheaten and other meals. Before being converted into glucose, the starch is first changed into dextrine, then into maltose, and finally into grape sugar. In malted foods, the malt flour is mixed with the finest wheaten flour, and the process of conversion into sugar is started and then stopped. On mixing the malted food with water the process recommences, and is carried on rapidly, either while being cooked or in the stomach, and in a short time the whole of the starch is turned into grape sugar and is ready for absorption. In most of the patented malt extracts sold, the change of starch into sugar has been carried too far, and the maltine has, as a food, not much more value than treacle or syrup. Both Sir William Roberts and Dr. Cheadle are agreed that these "malted foods" are quite unsatisfactory

as foods if taken only mixed with water ; but that, provided they still contain a considerable amount of active diastase, they make, if mixed with milk or gruel, valuable and highly digestible foods for invalids and delicate children.

How to make malt infusion (Sir William Roberts' method).—Mix three ounces of crushed malt thoroughly well with half a pint of cold water in a jug. Let the mixture stand over night. The supernatant liquid is then carefully decanted off from the sediment and strained through two or three folds of muslin, until it comes through fairly clear and bright. Malt infusion thus prepared has a light brown colour like sherry, a faint maltish taste, and the odour of beer-wort. It is prone to fermentation, and should be prepared fresh every day.

This method of preparing malt infusion is so simple, and the product is so efficacious in aiding the digestion of gruel and farinaceous foods, that it should be regarded as a household remedy. It costs three farthings a pint.

Malted gruel.—The gruel should be well boiled and strained to separate the lumps. When cool enough to swallow, the malt infusion is added. One tablespoonful will digest half a pint of gruel. The action is very rapid ; in a few minutes the gruel becomes thin from the conversion of the starch into maltose (Roberts). Other farinaceous foods, such as arrowroot, can be malted in the same way.

Peptonised Foods.

In cases of extreme debility of the digestive organs or arrest of the digestive function in the stomach, the opportunity which science gives the invalid of having digestion accomplished for him outside of the body, is one which the tormented dyspeptic may be expected to avail himself of with eagerness. But the object of using peptonised foods should be always to tide over a difficult time, not to encourage a habit ; to give the digestive organs physiological rest, so that they may recover power, not to enervate them

by continued disuse. Peptonised foods should therefore be used with caution and under medical advice.

Peptonised milk.—Dilute a pint of milk with a quarter of a pint of water, and heat to a temperature of 140 degrees. Then mix with the hot milk two teaspoonfuls of liquor pancreaticus and twenty grains of bicarbonate of sodium. The mixture is then poured into a covered jar, and placed in a warm place to keep up the heat. At the end of an hour and a half the milk is raised to the boiling point for a few seconds, after which it can be used as ordinary milk.

The cold method of preparing peptonised milk.—Add half a pint of water and twenty grains of bicarbonate of sodium to a pint of milk, and three teaspoonfuls of liquor pancreaticus. The mixture is then set aside in a room at about sixty or sixty-five degrees of temperature for three or four hours, at the end of which time it is ready for use. If used at once it need not be boiled ; but, if the milk has to be kept any time, it is better to bring it to the boiling point for a few seconds so as to arrest fermentation, and to prevent the production of a bitter flavour.

Peptonised soups, jellies, and blancmanges. — These can be prepared with a little ingenuity, it being always borne in mind that the peptonised fluid added to the stock, cream, isinglass, etc., used must have been boiled, and the action of the ferment arrested : otherwise a disagreeable bitter flavour will be communicated to the food, and the result will not be successful. In soups, peptonised gruel can be used instead of water ; in jellies it can be added to the isinglass or gelatine and flavouring matters ; in blancmanges peptonised milk is added to cream.

Peptonised milk gruel. — Make a good thick gruel. While still hot add an equal quantity of cold milk. To a pint of this mixture add two teaspoonfuls of liquor pancreaticus and twenty grains of bicarbonate of sodium. Set aside in a warm place for two or three hours, then raise to the boiling point and strain. The mixture should be watched and tasted from time to time, and boiled as soon

as a slight flavour of bitterness is perceived. If the peptonised process is allowed to go too far, the bitterness produced makes the gruel unpalatable.

Peptonised beef-tea has been already described.

If the above recipes be carefully and intelligently followed, invalid foods of the highest nutritive value to the patient can be made at very moderate cost; and if the previous chapters regarding digestion and assimilation have been well studied, the need for these foods and the *rationale* of their preparation will be easily understood. The subject will again be dealt with when treating of diet in acute fevers and convalescence from them.

CHAPTER XIX.

ACUTE GASTRITIS.

INDIGESTION may sometimes pass, owing to some temporary cause, from the chronic condition to the acute form of gastritis.

The causes of acute gastritis are various. Some particular article of food, such as, for example, mushrooms, mussels, or the skin of a fowl, has proved intractable to the digestive juices, and has remained undigested in the stomach. Here it becomes decomposed, and sets up inflammation of the gastric mucous membrane. Over-eating, or eating food in a state of decomposition, may also induce acute gastritis. The cause is, however, often difficult to discover; for, quite suddenly, a dyspeptic, who is digesting fairly well, may suddenly develop acute gastritis, and the digestive functions become completely suspended.

The symptoms are pain at the pit of the stomach, nausea, vomiting, loss of appetite, and general malaise.

The indications of rational dietetic treatment are two: First, to try and get rid of the substance which is setting up irritation in the stomach; and, secondly, to give the stomach physiological rest, so that it may recover its normal condition.

Emptying the stomach.—When acute gastritis is first set up, and it is suspected that the pain is caused by some undigested article of food in the stomach, it is well to wash out this organ without delay. This can be done without the use of the alarming stomach pump. If about a pint of hot water be drunk, and the back of the throat tickled with the finger or the handle of a tooth-brush,

vomiting is provoked, and the contents of the stomach are forcibly ejected. Among the chyme and half-digested food vomited will generally be found some one thing which has been eaten at a meal, perhaps the previous day or several hours before, and which is still quite undigested. Let the patient continue to drink hot water and to provoke vomiting, until the stomach is completely washed out. A serious attack of acute gastritis may often be prevented by this simple and common-sense expedient.

Resting the stomach. — If, however, the gastritis is established, the stomach must be rested. For one or two days no food of any kind should be taken. A little ice in small lumps can be sucked to prevent nausea and to allay thirst. After this enforced abstinence the stomach will possibly be able to absorb a little predigested food. Predigested beef-tea, the making of which is described on page 114, is the most easily assimilable. If this is found not to disagree, predigested milk in small quantities at a time may be given. As the patient recovers appetite raw meat juice and raw meat balls (*vide* page 115) should be carefully added to the dietary. At this stage Leube's meat solution would be a valuable food. This requires an intelligent cook to prepare ; but if the directions are carefully followed there is no difficulty about it.

Recipe for Leube's Meat Solution.—One pound of lean beef is minced very fine and mixed in a fire-proof porcelain jar with a pint of water and three teaspoonfuls of pure hydrochloric acid. The mixture is then placed in a Papin's digester, and the lid screwed firmly down. It is boiled from ten to fifteen hours. In a Papin's digester the steam cannot escape, and the water is thus kept boiling at a much higher temperature than in an exposed vessel. After being boiled this length of time, the mass is taken out and pestled in a mortar till of a smooth paste. It is then returned to the digester and boiled again for nearly twenty hours. It is removed and spread out on a flat dish and the acid is carefully neutralised with pure carbonate of soda. Returned to an open enamelled saucepan it is slowly evaporated to a syrupy consistence. In order to make this food palatable a little spice and celery seed should be added to the meat, and before serving care should be taken to make it both look

and taste nice. In this meat solution the meat has been partly predigested, but all the albumen has not been turned into peptone. It is, therefore, a useful intermediate food.

Care must be exercised not to take predigested foods too long, else the stomach becomes demoralised, and the very condition aimed at, the return to normal digestive power, is delayed. Predigested foods are crutches, which must be discarded as soon as there are indications of the return of healthy appetite, and that the stomach can digest its foods, instead of having them digested for it outside the body.

The return to solid food should be very gradual, and only the most easily digested foods should be attempted, such as the ball of a well-grilled mutton chop warrenised, and not boiled, mutton or chicken. All uncooked vegetables or salads, and any hard chippy articles, such as fried bread crumbs, should be avoided, also any foods or dishes which are found by experience to produce the uncomfortable sensations of indigestion.

Nutrient enemata.—In cases where the gastritis is both acute and persistent, in which nausea and vomiting are incessant, and the weakness of the patient progressive, it may be necessary in order to give the stomach rest, and at the same time to maintain the strength, to resort to nutrient enemata. In using these two important things must be borne in mind, namely that the absorbent powers of the mucous membrane of the rectum are slight and slow, and also that irritation may easily be set up. The foods selected for nutrient enemata should be, therefore, easily absorbed and bland. It has been found by experiment that albumen, peptones, starch, and fat in the form of an emulsion, are all absorbable in the rectum. It is well, however, to administer the albumens and starch predigested, and hence peptonised beef-tea and peptonised milk gruel, or maltine with peptonised milk, are the most useful foods for rectal alimentation. Not more than from one to three ounces should be injected at the time, warmed to the temperature

of the body. A long tube carefully oiled should be used, and to obtain the best results the rectum should be washed out with lukewarm water an hour before the enema is administered (Yeo). In cases where more solid food can be retained and absorbed in the rectum, Leube's meat and pancreatic paste may be injected. This is made by mincing two to four ounces of meat with a half to one ounce of fresh pancreas free from fat. Pestle in a mortar with a small amount of lukewarm water till the whole is reduced to a smooth paste, of a consistence sufficiently fluid to pass up the tube of the enema. It should be injected warm. Life cannot be maintained for long on nutrient enemata, and their continued use may provoke obstinate diarrhœa ; but they may prove of great value in cases of acute gastritis or of ulcer of the stomach, when it is of the utmost importance to give the stomach absolute rest while still maintaining the strength of the patient.

CHAPTER XX.

ULCER OF THE STOMACH.

When dyspepsia is of long duration and severe in character, and is accompanied with persistent vomiting and acute pain after food, ulcer of the stomach may be suspected; if to these symptoms is added the vomiting of blood, then there is little room for doubt. Ulcer of the stomach is a most intractable disease, and its situation in a hollow organ which is subject to incessant movement during the process of gastric digestion, renders it very difficult to treat.

Ulcer of the stomach is of different kinds; it may be small, circular, or oval in shape, with sharp, perpendicular edges, and looking as if a portion of the mucous membrane of the stomach had been punched out; or it may be large and spreading, with thickened sloping edges. The floor of the ulcer may be formed of the outer coats of the stomach; or it may be constituted by one of the adjoining organs, the liver or pancreas, which has become adherent to the stomach by the process of inflammation and ulceration having extended to its surface. Sometimes gastric ulcers cicatrise and heal, sometimes they remain quiescent for a time, giving the false impression that cure has taken place; but the ulcerative process often begins again, and in many cases ends in perforation. Perforation may take place into the peritoneum, into the colon or intestine, or into an artery, in which case profuse hæmorrhage occurs. Sometimes, however, ulceration and infiltration of the tissues may extend to the adjoining organs, and a com-

munication may even thus be established between the stomach and the external air through the abdominal walls.

The symptoms of gastric ulcer are pain, vomiting, and hæmatemesis or bleeding from the stomach. The pain is characteristic. It occurs almost immediately after taking food, and it is either felt at the epigastrium, which becomes tender on pressure, or it is referred to the region of the spine corresponding to the last two or three dorsal or first two or three lumbar vertebræ, or to the region between the shoulders, the muscles on either side often being tender; or again it may occupy the umbilicus or some area or point near, and when severe it radiates from its chief point of intensity towards the œsophagus, backwards to the loins, or downwards and laterally over the whole of the abdomen. The pain, when severe, is of a burning, boring, and shooting character, attended with a sense of soreness. Vomiting is a later symptom, but it is generally very persistent. The pain and vomiting occur soon after the ingestion of food. Hæmorrhage takes place from time to time, the bleeding being from the excoriated surface of the ulcer, or when very profuse from the erosion of an artery.

The tendency of gastric ulcer is towards recovery; and when death occurs it is from perforation of an artery causing profuse hæmorrhage, or from perforation into the peritoneum, when collapse and death take place in a few hours, or from perforation into the viscera. Death may be caused by exhaustion in consequence of the patient sinking under the long-continued pain and vomiting, and becoming worn out by the want of food (Bristowe).

Treatment by diet.—It is obvious that in this distressing and painful malady diet is of the greatest importance, the necessity and aim being to maintain the strength of the patient by such food as can be digested without provoking movements of the stomach, and without causing the dreaded pain and vomiting. The object must be to give the stomach as much rest as possible, so that cicatrisation

of the ulcer can go on uninterruptedly. Food must therefore be given in very small quantities at a time, and at short intervals. In cases where there has been severe hæmorrhage, and where it is likely to recur, the stomach must be kept absolutely at rest, and the patient fed by nutrient enemata for a few days at least.

An exclusive milk diet is the diet indicated, and this is, as a rule, well borne in ulcer of the stomach. The casein of milk is, however, thrown down as curds on coming in contact with the gastric juice of the stomach, and these curds are often difficult of digestion, especially the curds of cow's milk, which are large and flocculent. To prevent their formation the milk should be mixed with an equal quantity of lime water or an alkaline water. Dr. Burney Yeo recommends that to every four ounces of milk be added ten grains of bicarbonate of sodium, five grains of light magnesia, and ten grains of common salt dissolved in a tablespoonful or two of water. This may be taken every two or three hours. The yolk of an egg beaten up with two tablespoonfuls of hot water may, if required, be added to the cup of milk, and given twice a day, or an ounce of the crumb of a stale roll, well soaked previously in hot water, may be mixed with the milk two or three times a day (Yeo). Buttermilk is sometimes recommended, as curdling of the milk in the stomach is thus avoided, but the sour taste of the buttermilk is disliked greatly by some patients. Malt extract is recommended by some physicians, and a *purée* of potatoes in cases where a vegetable food is well borne.

In some cases a milk diet cannot be endured.—There may be a distinct intolerance of milk—and recourse must be had to bouillons and *purées* of meat. The meat or chicken must be reduced to a fine pulp and mixed with a little broth or beef-tea. Leube's soluble meat (see page 120) is much used in Germany in these cases; it is so prepared that it is ready for immediate absorption without the action of the gastric juice, and hence it must be a valuable pre-

paration for ulcer of the stomach, where it is necessary to obtain healing by rest.

Hot tea and coffee, gruel, porridge, and alcoholic drinks are strictly forbidden.—If the symptoms of pain and vomiting have disappeared, after two or three weeks of this restricted diet, there may be a gradual return to more solid food, but the greatest caution must be exercised not to take more food than is absolutely required for the support of the body.

Useful Recipes for Convalescents.

Purée of Chicken.—Remove all the skin and bones from part of a roast chicken. Chop the meat, pound it in a mortar and rub it through a sieve. Take the bones of the chicken and boil them for several hours with a shalot, a small piece of carrot, two leaves of celery, a bouquet of herbs, and enough water to cover them. Strain through a hair sieve and remove all the fat. Add the pounded meat, and simmer until it is sufficiently thick; add half a gill of cream, a few drops of lemon juice, and a small lump of sugar.

Creme de Volaille.—Melt half an ounce of butter and half an ounce of flour together in a saucepan, and add half a gill of white stock. Take the flesh of half a chicken, chop, pound it, and rub it through a sieve. When the sauce is cool, add one egg and half a pint of whipped cream, and mix all together. Put it into a buttered mould and steam for a quarter of an hour.

Steamed Sole.—Skin and fillet a sole; wash and dry the fillets, and put them in a jam-pot just large enough to hold them; sprinkle a little salt and lemon juice over them, and cover them with a buttered paper. Put the jam-pot into a saucepan half full of boiling water. Cover it tightly, and let it boil for ten minutes. Mix an ounce of butter with one ounce of flour in a saucepan over the fire, add one gill of milk and liquor from the fish, and cook for ten minutes, stirring well. Pour this sauce over the fillets, and garnish with slices of lemon and a sprig of parsley on the top of each fillet.—(*Art of Feeding the Invalid.*)

CHAPTER XXI.

DIABETES.

Diabetes was considered not so long ago to be an incurable and inevitably fatal disease. Thanks, however, to the labours of Claude Bernard, Germain Sée, and Pavy, the cause of this mysterious wasting disease has been discovered to be an inability on the part of the economy to assimilate starch and sugar, and, in the severer cases, in the morbid production of sugar from the tissues themselves. Hence diet and the rigid exclusion of starch and sugar from the food become the most important factors in the treatment of diabetes. The value of starch as a food, and its behaviour in the body, are as follows.

The action of starch in the body, and what becomes of it.—Starch is quite indigestible in the uncooked state ; when cooked it is insoluble, and incapable of passing through the membranes of the blood vessels of the stomach and intestine. To be rendered soluble and capable of assimilation it must be converted into glucose or grape sugar. This conversion of starch into glucose takes place partly in the mouth, by the action of the diastase of the ptyaline of the saliva, but much more rapidly in the duodenum by the action of the pancreatine of the pancreas. Cane sugar is dissolved by the fluids of the stomach, or is swallowed in a soluble condition. The soluble glucose and sugar are absorbed by the veinules of the stomach and intestine, and carried at once by the portal vein to the liver. In the liver the sugar is lost sight of ; though after the ingestion of food the portal vein may contain an abundance of saccharine matter in solution, there is not a trace of sugar in the blood of the hepatic vein of a healthy person.

What, then, becomes of the sugar in the liver?—This is a question which has been partially solved for us by the researches of Claude Bernard. He discovered the presence of an amyloid or starchy substance, which he called glycogen, stored in the liver cells; and the result of his researches tends to show that the soluble glucose which is brought to the liver by the portal vein is converted by means of a strange and not well-understood action of the liver cells into this insoluble substance or glycogen, which is then stored up in the cells. It is there available, as Claude Bernard insisted, for conversion again into sugar to be carried off by the capillaries and burnt up in the tissues in the course of tissue change and the production of energy. Claude Bernard contended that the liver was a magazine for the storage of sugar in the form of glycogen, and the regulation of its supply to the economy. Without the interposition of the liver, sugar would obviously be introduced into the circulation in irregular quantities at the moment of digestion, which would have a very disturbing influence on the system. It has since, however, been strenuously denied by Pavy that glycogen is ever reconverted into sugar, or that sugar is burnt up in the tissues. Recent researches tend to show that the formation of glycogen in the liver is the first step in the metamorphosis of starch and sugar into fat, and that it is fat and not sugar which is the hydro-carbon burnt up in the tissues.

The cause of diabetes.—Now it is obvious that, if by some morbid change in the liver cells they have lost the power of arresting the sugar and converting it into glycogen, the sugar will pass into the general circulation, and that it will appear in the urine. This is what takes place in diabetes. The indication is therefore to check the ingestion of starch and sugar. There is also another dietetic indication given by understanding the normal physiological process. If, as is believed, fat is manufactured from glycogen, the emaciation and weakness so

characteristic of diabetes are due to the want of fat in the tissues, which fat is not only deposited in a smaller degree than usual, but is consumed in the production of force. It is therefore obviously necessary that as we deprive the diabetic of the carbo-hydrates of starch and sugar in his food, we should supply their place with the hydro-carbon of fat.

Diabetes may be divided into (1) glycosuric dyspepsia, (2) diabetes minor, (3) diabetes major.

1. In simple cases of **glycosuric dyspepsia** the disorder seems to be functional. It generally rapidly yields to dietetic treatment, and the sugar which may be present in the urine in the first instance in considerable quantities disappears almost completely, if not entirely, by the rigid exclusion of starch and sugar from the diet. In these cases it seems as if the liver had lost its power of converting sugar into glycogen, and that therefore the sugar ingested with the food, escapes unchanged into the blood. The excessive thirst, the malaise, and the dyspepsia characteristic of the malady disappear on the enforcement of a rigid diet, but they make their appearance again on any relaxation of the regimen.

2. In **diabetes minor** there is probably some permanent impairment of the powers of the liver; and though by the maintenance of a diet devoid of starch and sugar the amount of sugar in the urine may be considerably reduced, it is scarcely ever banished altogether. It is these cases which derive so much benefit from the treatment by alkaline waters, carried out at Carlsbad and Vichy. This form of diabetes is frequently associated with gout, or what is called the uric acid diathesis. The continual maintenance of an exclusive diet has a quite remarkable influence in cases of diabetes minor; and whereas patients heretofore, before the cause and nature of diabetes were discovered, would drag out a miserable existence, tormented with thirst, growing weaker from increased muscular feebleness and doomed to an early death, they can now be

kept in fairly good health by a rational dietary, which it is neither painful nor disagreeable to maintain.

3. **Diabetes major** generally occurs in young and thin persons, and is a very grave malady. It is little influenced by diet; for though starch and sugar may be excluded, and the patient may be kept exclusively on flesh diet, the liver in this case exercises its power to break up the nitrogenous elements and to extract glycogen from albuminous foods, and even from the tissues of the patient himself; so that he is, as it were, devoured by the abnormal activity of his own liver.

Two opposite causes for diabetes.—It is seen from the foregoing that similar symptoms are produced by totally opposite conditions. In diabetes minor the glycogenic function of the liver is depressed, and it fails to convert the sugar brought by the portal vein into glycogen. In diabetes major the glycogenic function of the liver is abnormally excited, and the liver cells convert into glycogen even the nitrogenous elements of the muscles of the patient. It is a question whether we have not here to do with two totally different diseases, and that, owing to the presence of an identical symptom, *viz.*, the presence of sugar in the urine, we do not err in submitting both classes of patients to the same regimen. In the first, the exclusion of starch and sugar is well borne; in the latter, the economy seems to cry out for sugar, in order to feed the rapacious voracity of the liver. The most, however, that can be done in cases of diabetes major is to relieve the sufferings of the patient, and to make the end as easy as possible.

CHAPTER XXII.

DIABETES—(*continued*).

The dietetic treatment of diabetes is one of intelligent watchfulness. Cases differ so much from one another that no hard and fast rule applicable to all can be laid down. What is harmful to one patient is well borne by another; and whereas a rigid regimen can be followed by one person, its maintenance leads to adverse complications in another. The successful treatment of the diabetic patient lies in fact between his cook and his doctor; in the careful and intelligent preparation of his food on the one hand by the cook, and on the other in the checking and control of his diet by the physician, according to the physical signs given by examination of the patient and his urine. On these depend the maintenance of a fair standard of health and comfort.

The following table, showing the percentage composition of various articles of food, will be found to be most valuable to refer to in preparing the diet not only of diabetics, but of other invalids :—

	Water.	Albumen, etc.	Starch, etc.	Sugar.	Fat.	Salts.
Bread . . .	37·	8·1	47·4	3·6	1·6	2·3
Biscuit . . .	18·	15·6	73·4		1·3	1·7
Wheat flour . .	15·	10·8	66·3	4·2	2·0	1·7
Barley meal . .	15·	6·3	69·4	4·9	2·4	2·0
Oatmeal . .	15·	12·6	58·4	5·4	5·6	3·0
Rye meal . .	15·	8·0	69·5	3·7	2·0	1·8
Indian corn meal .	14·	11·1	64·7	0·4	8·1	1·7
Rice . . .	13·	6·3	79·1	0·4	0·7	0·5
Peas . . .	15·	23·0	55·4	2·0	2·1	2·5
Arrowroot . .	18·	—	82·0	—	—	—

	Water.	Albumen, etc.	Starch, etc.	Sugar.	Fat.	Salts.
Potatoes	75·	2·1	18·8	3·2	0·2	0·7
Carrots	83·	1·3	8·4	6·1	0·2	1·0
Parsnips	82·	1·1	9·6	5·8	0·5	1·0
Turnips	91·	1·2	5·1	2·1	—	0·6
Cabbage	91·	2·0	5·8		0·5	0·7
Sugar	5·	—	—	95·0	—	—
Treacle	23·	—	—	77·0	—	—
New milk	86·	4·1	—	5·2	3·9	0·8
Cream	66·	2·7	—	2·8	26·7	1·8
Skim milk	88·	4·0	—	5·4	1·8	0·8
Butter milk	88·	4·1	—	6·4	0·7	0·8
Cheese	36·8	33·5	—	—	24·3	5·4
Cheddar cheese	36·	28·4	—	—	31·1	4·5
Skim cheese	44·	44·8	—	—	6·3	4·9
Lean beef	72·	19·3	—	—	3·6	5·1
Fat beef	51·	14·8	—	—	29·8	4·4
Lean mutton	72·	18·3	—	—	4·9	4·8
Fat mutton	53·	12·4	—	—	31·1	3·5
Veal	63·	16·5	—	—	15·8	4·7
Fat pork	39·	9·8	—	—	48·9	2·3
Green bacon	24·	7·1	—	—	66·8	2·1
Dried bacon	15·	8·8	—	—	73·3	2·9
Ox liver	74·	18·9	—	—	4·1	3·0
Tripe	68·	13·2	—	—	16·4	2·4
Cooked meat, roast, no dripping being lost. Boiled, assumed to be the same	54·	27·6	—	—	15·45	2·95
Poultry	74·	8·8	—	—	3·8	1·2
White fish	78·	18·1	—	—	2·9	1·0
Eels	75·	9·9	—	—	13·8	1·3
Salmon	77·	16·1	—	—	5·5	1·4
Entire egg	74·	14·0	—	—	10·5	1·5
White of egg	78·	20·4	—	—	—	1·6
Yolk of egg	52·	16·0	—	—	30·7	1·3
Butter and fats	15·	0·1	—	—	83·0	2·0
Beer and porter	91·	0·1	—	8·7	—	0·2

There is one broad rule to be followed in the preparation of the diet of a diabetic, that is to avoid all articles

containing starch and sugar. The following list of articles of diet which may be allowed or must be forbidden to a diabetic, is based both on the published opinions of observers and on practical experience, and is given as a dietary table which may be faithfully followed. This table should be written out plainly on a piece of cardboard, and hung up in the kitchen of a diabetic patient for the guidance of his cook and housekeeper.

Allowed.	*Forbidden.*
Butcher's meat of all kinds.	Sugar in any form.
Ham, bacon, and tongue when not sugar-cured.	Wheaten bread, oatmeal cakes, porridge.
Poultry and game.	Ordinary biscuits.
Fish of all kinds.	Rice, arrowroot.
Oysters and shellfish.	Potatoes, carrots.
Crabs, lobsters.	Parsnips, beans, and peas.
Beef-tea, broth, not thickened.	Sago, tapioca.
Soups, made of meat stock without any starchy thickening.	Macaroni, vermicelli.
Jellies made without sugar.	Spanish onions.
Aspic.	All sweet fruits, such as grapes, cherries, peaches, strawberries, apricots, plums, gooseberries, currants, oranges, and all preserved fruits.
Tripe.	Pastry.
German sausage.	Puddings of every kind which contain sugar or farinaceous foods.
Eggs, cheese, cream cheese, and cream.	Beetroot.
Butter, fat, oil, and lard.	Liver.
Caviare.	English sausages.
Almond cakes, bran cakes and gluten bread, as substitutes for wheaten bread.	Treacle.
"Torrefied" or charred bread.	
Saccharin to replace sugar.	
Cabbage, endive, spinach.	
Broccoli, Brussels sprouts.	
Lettuce, spring onions.	
Cucumber, green asparagus.	
Watercress, sorrel.	
Salad, celery, tomatoes.	
Artichokes, mushrooms.	
Cauliflowers, sea-kale.	
Turnips, French beans.	

Allowed.	*Forbidden.*
Vegetable marrow, dandelion.	
Cardoons, mustard and cress.	
Radishes, turnip-tops and nettles.	
Unripe fruits, such as green gooseberries, green currants, and unripe apples cooked with saccharin.	
Nuts of all kinds except chestnuts.	
Sardines in oil.	
Foie gras.	
Norwegian herrings in oil.	
Pilchards in oil.	
Pickles.	
Savoury jelly.	
Custard.	
BEVERAGES.	
Tea and coffee.	Champagne, and all sweet and sparkling wines.
Cocoa made from nibs and mixed with cream.	Sweet ales, mild and old porter and stout.
Water, soda-water.	Cider and perry.
Vichy and Apollinaris waters.	Sweetened lemonade.
Claret and Burgundy.	Port wine and Madeira.
Dry sauterne and chablis.	Liqueurs.
Champagne, sugar free.	Rum and sweetened gin.
Brandy and whisky, in small quantities, unsweetened.	Patent cocoas and chocolates.
Milk, sparingly.	Sorbets.
Lemonade, made of fresh lemons, and sweetened with saccharin.	Fruit juices and syrups.
Bitter ale, in moderate quantity.	Ginger beer.

From this list it will be seen that the number of articles permitted a diabetic is large. The exclusion, however, of certain articles which we have come in modern times to look upon as of absolute daily necessity, is often felt severely, particularly at first, till the ingenuity of the cook has been exercised to discover an agreeable and varied dietary within the limits imposed. The strict exclusion of bread, the staff of life, is that which is felt most, and the patient ill reconciles himself to the gluten and bran breads and almond cakes which have been introduced as substitutes for wheaten bread, although these are useful in making an agreeable

variation in the diet. It is well and wise so cleverly to design and arrange the food of a diabetic patient that he can take his meals with his family, at a common table and from the same dishes, unaware, and without being constantly reminded, that he must not take this and must not touch that. To show how easily this can be done will be the object of subsequent chapters.

The examination of the urine.—In order satisfactorily to carry out the dietetic treatment of a diabetic patient it is necessary to examine the urine daily. The initial physical sign of diabetes is the excretion of sugar; stop this, and the symptoms of thirst, dryness of the mouth, lassitude and weakness are arrested. The effect of excluding starch and sugar from the diet can only be accurately ascertained by discovering if the excretion of sugar by the urine is arrested or diminished. There are various ways of **testing the presence of sugar in the urine.** The following is the easiest, and is one which can be well practised by a nurse. To a small quantity of urine in a test tube add half the amount of liquor potassæ or liquor sodæ, and boil. If sugar is present, a yellowish brown colour soon makes its appearance. This brown discoloration of the urine becomes more intense as the boiling is continued, and will be the deeper in tint the larger the proportion of sugar contained, becoming finally almost black if the quantity is very large. The coloration is produced by the colourless sugar being turned into brown molasses by heat, much in the same way as a deep brown sticky fluid is produced when a piece of lump sugar is burnt in a candle. If now to the coloured fluid in the test tube be added a few drops of nitric acid, the brown coloration disappears, and there is an odour of burnt molasses. To ascertain **the amount of sugar present** is a more difficult laboratory process; but any nurse who has charge of a diabetic patient, or anybody who is closely watching the effect of diet on a diabetic person, should once a week, or at least once a month, collect the total quantity of urine passed in the twenty-four hours, and

send a specimen to a doctor or a chemist for analysis and report. This analysis will be her chart, showing her how to direct her course of dietetic treatment. For her compass she needs to take daily the **specific gravity of the urine,** and to ascertain roughly, though with fair correctness, the amount of urine daily passed. As it would be troublesome and unadvisable for the patient to collect the whole of the urine passed in the twenty-four hours, a sufficiently accurate estimate can be obtained by collecting the amount of urine passed at night in the bedroom. This should be measured every morning, and the specific gravity taken. The record should be entered in a book, and kept for comparison with the record of the dietary of the patient, so that the effect of the food taken can be judged by watching its influence on the amount and the specific gravity of urine excreted. The **normal specific gravity of the urine** is about 1·025. This varies greatly, even in healthy persons, and may rise to 1·030 or fall to 1·015 without any deviation from health, but if the specific gravity is found to be constantly at or above 1·030, sugar may be suspected. The **normal amount of urine excreted** by a healthy man is about three pints; in the diabetic this may be very much increased.

A diabetic record.—The following extracts from the record of a diabetic patient, which was kept for several years, will show exactly what I mean, and how a nurse or a non-scientific person may easily check and ascertain the effects of diet on the patient under observation.

Date.	Quantity passed at Night.	S. G.	Remarks.
Jan. 9th	30 oz.	1·025	
,, 10th	30 ,,	1·034	
,, 11th	21 ,,	1·023	
,, 12th	24 ,,	1·031	Dinner party, took sweets.
,, 13th	34 ,,	1·020	
,, 14th	26 ,,	1·013	Nervous, low spirits.
,, 15th	28 ,,	1·030	Dined out.
,, 16th	16 ,,	1·039	Tongue raw.
,, 17th	22 ,,	1·030	
,, 18th	22 ,,	1·015	Much better, tongue better.

Date.	Quantity passed at Night.	S. G.	Remarks.
Feb. 17th . .	20 oz. . .	1·025	
,, 23rd . .	— ,, . .	1·020	
,, 24th . .	— ,, . .	1·035	Two helpings of treacle pudding.
,, 26th . .	— ,, . .	1·028	
Apr. 5th . .	28 ,, . .	1·030	
,, 6th . .	30 ,, . .	1·040	
,, 7th . .	30 ,, . .	1·040	Left off taking bread.
,, 8th . .	24 ,, . .	1·038	
,, 9th . .	24 ,, . .	1·033	
,, 10th . .	29 ,, . .	1·012	
,, 11th . .	24 ,, . .	1·026	

In this patient, who for ten years was carefully and successfully dieted, any indiscretion, such as was committed when dining out, or in taking treacle pudding, was immediately detected by the specific gravity bulb, which, it will be found, gives sure and faithful directions as to the course of dieting to be pursued.

Weighing the patient.—Emaciation is frequently a marked symptom of diabetes, and one which it is most important to check. A weighing machine should form part of the furniture of the bedroom of a diabetic, and he should be weighed at regular intervals, and the record kept. By depriving the patient of all starch and sugar in his diet, which, as we have shown in the earlier chapters, are the foods out of which much of the fat of the body is manufactured, and by his wasteful excretion of sugar, the body naturally emaciates. It becomes, therefore, of the greatest possible importance when framing his dietary not only to exclude starch and sugar, but to compensate for this exclusion by giving an excess of fatty foods. The influence of these must be noted by means of the weighing machine.

We thus see that it is not only necessary to diet a diabetic patient, but closely and carefully to watch the effect of this diet on him, by ascertaining and recording its influence on the specific gravity and the amount of urine daily secreted, and on his loss or gain of flesh.

CHAPTER XXIII.

DIABETES—(*continued*).

Ménus and Recipes.

The principles of a diabetic dietary.—In order to facilitate the duties of the cook and housekeeper in providing for a diabetic patient an agreeable dietary, from which starch and sugar have been excluded, I have arranged a series of *ménus* for the day's meals, and will give, in many instances, the recipes for the dishes. It will be noticed in studying these *ménus* that four principles have been followed—*firstly*, to exclude starch and sugar; *secondly*, to supply their place by the hydro-carbon fat, so that there may not be a lack of energy-producing and fat-forming food; *thirdly*, to make the meals digestible, a weakened digestion being a frequent accompaniment of diabetes; and *fourthly*, to make the food as appetising as possible. Thus, with these objects in view, it will be seen that cream is used in the place of milk, cream being practically free from lactose, or sugar of milk; unripe fruits sweetened with saccharin take the place of ripe fruits; Bonthron's almond biscuits grated are used in thickening soups and sauces instead of arrowroot, and almond flour is employed instead of wheaten flour. Fish and vegetables are cooked with a liberal allowance of butter, and every opportunity is taken of adding the necessary amount of fat by means of such dainties as *foie gras*, cream cheese, olives, etc. In order to make the food digestible, directions are given to warrenise instead of to boil, and to braise instead of to bake. It will, I trust, be seen from these *ménus* that it is quite unnecessary

to add to the miseries already endured by a diabetic that of a repulsive and unpalatable diet. A common-sense combination of science and the culinary art will produce for him as dainty dishes as any epicure may desire.

A WEEK'S *MÉNUS* FOR A DIABETIC.

(Time—Summer.)

FIRST DAY.

Breakfast.

Buttered eggs.
Sole, fried in butter, with lemon juice added when served.
Cocoa made from nibs, with cream,
and "torrefied bread". (1)

Lunch.

Hot sardines on toasted gluten bread. (3)
Warrenised breast of lamb, with spring cabbage. (2)
Camembert cheese with Callard's cheese biscuits.

Dinner.

Spinach soup. (4)
Cutlets of salmon fried in slippers.
Poulet à l'estragon. (5)
Green-gooseberry fool (6), sweetened with saccharin.

Recipes.

(1) TORREFIED BREAD is made by toasting thin slices of ordinary bread before the fire until they are deeply and thoroughly browned, almost blackened, so that the starch and gluten are in great part destroyed by the heat (Yeo).

(2) WARRENISED BREAST OF LAMB, WITH SPRING CABBAGE.—A Warren cooking pot is a very necessary *article de cuisine*. It is a pot consisting of three stages connected by a steam chimney. A small amount of water is put in the bottom of the pot; in the second stage the meat is placed with its flavourings, and in the top the vegetables. The food is, it will be seen, thus cooked by steam; all the juices of the meat are therefore retained, and not lost in the water as in boiling. Meat is rendered much more succulent, tender, and digestible by warrenising than by boiling.

(3) GLUTEN BREAD cut into slices, soaked in butter and toasted or fried, is very palatable, and will be found a useful article in the preparation of food for diabetics.

(4) Spinach Soup is made from a weak meat or bone stock, to which a fine purée of spinach is added. Some cream is added when the soup is poured into the tureen. Purée soups made of the vegetables permitted are very useful additions to the dietary. Among them may be mentioned turnip, tomato, sorrel, lettuce, and asparagus soups, to all of which cream may be added with advantage if it is well tolerated by the patient.

(5) Poulet à l'Estragon.—It will be found useful to study the various ways of preparing fowls from French and English cookery books, the forbidden ingredients being replaced by those permitted. The amended receipt can then be written out by the housekeeper and given to the cook for her guidance. Poulet à l'estragon is a very palatable dish. Before cooking, the liver is removed and a bunch of fresh tarragon is placed inside the fowl. The fowl is then roasted or braised. When finished it is cut into joints which are placed upon croutons of gluten bread, the whole being sprinkled with chopped leaves of fresh tarragon. Fresh roasted tomatoes are placed round the dish. The liver and giblets are stewed with tarragon leaves. When sufficiently cooked the liver is rubbed through a fine hair sieve to thicken and flavour the gravy, which is served in a sauce boat.

(6) Green-gooseberry Fool.—The deprivation of ripe fruits is often severely felt by the diabetic patient. It is, however, perfectly safe for him to take unripe fruits before the sugar is developed in them, and these can be made into palatable and digestible dishes by stewing them with saccharin, passing them through a sieve, as in "fools," or mixing cream into them.

Second Day.

Breakfast.

Fresh haddock fried in butter.
Cold tongue.
Coffee and cream.

Lunch.

Vegetable marrow farcie. (7)
Devilled ham and French beans. (8)
Cheddar cheese with diabetic biscuits and butter.

Dinner.

Oysters.
Clear soup.
Roast lamb.
Green asparagus with clear melted butter.
Almond pudding. (9)

Recipes.

(7) Vegetable marrow or cucumber makes an excellent dish boiled and stuffed with veal forcemeat, in which, instead of bread crumbs or flour, Bonthron's grated almond biscuits must be used, but the forcemeat must be bound together with a beaten egg.

(8) "Devils" are easily made, and render a dish of cold meat palatable and savoury. A paste is made of almond flour, curry powder, mustard, salt, and oil, with sauces to vary the flavour. This is spread on the cold meat to be devilled, before grilling. Served hot.

(9) Almond Pudding and Cakes.—The correct making of almond pudding and almond cakes by the cook of a diabetic is an art to be practised and mastered. When sweetened with saccharin they make tasty sweet dishes, which prevent the patient from missing and longing for the forbidden puddings of former days. The following recipes will be found most valuable:—

Almond Pudding.—Take two eggs, a quarter of a pound of almond flour, a quarter of a pound of butter, and three tabloids of saccharin dissolved in a tablespoonful of brandy. Warm the butter, beat in the almond flour and the yolks of the eggs, adding the dissolved saccharin. Whisk the whites into a stiff froth, beat all together. Put into dariole moulds and bake in a quick oven, and serve with a little hot sauce made with dry sherry and saccharin.

Almond Biscuits.—To every ounce of almond flour add two whites of eggs and a little salt to taste. Beat the whites to a stiff froth, add the almond flour, and beat well together. Put in buttered patty-pans, and bake in a moderately quick oven from fifteen to twenty minutes. The whole has to be done quickly, and baked directly the ingredients are mixed. This biscuit will be found very useful as a substitute for bread.

Third Day.

Breakfast.

Fresh herrings with mustard sauce.
Savoury omelette.
Tea with cream.

Lunch.

Cold mutton with French bean salad mixed with oil and a dash of vinegar.
Stewed lettuce. (10)
Roquefort cheese with diabetic rusks.

Dinner.

Tomato soup.
Sweetbreads aux fonds d'artichauts. (11)
Fillet of beef garnished with cauliflowers.
Custard pudding sweetened with saccharin.

Recipes.

(10) Stewed Lettuce.—A well-grown lettuce is selected. It is first boiled in plenty of water, care being taken not to let it drop to pieces. When nearly done take out, drain, and place in a stew-pan with a little rich brown gravy, and allow it to simmer for twenty minutes.

(11) The Sweetbreads are first stewed in milk, then removed and rolled in slices of fat bacon and placed in the oven for a quarter of an hour. The bacon is then removed, and the sweetbreads are cut in slices, and grated Parmesan cheese is shaken over them. They are again placed in the oven and braised in a rich brown glaze. Served on a crouton of gluten bread, in the centre of which is placed the *fonds d'artichauts* boiled and cut in quarters.

Fourth Day.

Breakfast.

Curried eggs (without rice). (12)
Ham.
Cocoa made from nibs, with cream.

Lunch.

Braised knuckle of veal with mixed vegetables. (13)
Foie gras with diabetic biscuits.

Dinner.

Cock-a-leekie soup.
Turbot with tartar sauce.
Duck with olives.
Cucumber au sauce Fairlawn. (14)

Recipes.

(12) In making Curries, cocoanut or green apples can be used as the basis of the curry.

(13) The braising of meats makes them much more digestible and also more savoury than roasting. Put in the braising pot a little fat or butter and finely-chopped onion, and brown the knuckle of veal in it. Then add more fat—bacon fat being preferable—a few vegetables, spices, a bunch of herbs, salt, and pepper. Close the pot securely so as not to let the steam escape, and place hot coals

on the lid from time to time to obtain equal heat top and bottom. Time taken, half as long again as for roasting.

(14) Cooked Cucumber is a very useful article. It is boiled in the same way as vegetable marrow. "Sauce Fairlawn" is made from butter, milk, and yolks of eggs, adding three tablespoonfuls of grated Parmesan before serving. This sauce is poured over the cucumber in the dish when served.

Fifth Day.

Breakfast.

Eggs, with black butter.
Grilled kidneys and bacon.
Cream and aerated water.

Lunch.

Fish pudding. (15)
Cold meat and tomato salad.
Neufchatel cream cheese and almond biscuits.

Dinner.

Bisque soup. (16)
Boiled fowl, with béchamel sauce (17) and baked mushrooms, vegetable marrow.
Green currant fool.
Hot caviare on gluten croutons.

Recipes.

(15) Fish Pudding.—Make a thick white sauce of butter, milk, and yolks of eggs, to which either anchovy, Worcester, or Harvey sauce, ketchup, a little chopped anchovy, shredded onion, and a small amount of pickled mango are added according to taste. Pour the sauce over the fish after it has been broken up, and bake in a dish in the oven.

(16) Bisque Soup.—This is made in the usual way, except that it is thickened with almond biscuits grated instead of rice.

(17) In the Béchamel Sauce the beaten yolks of two or more eggs are added to thicken.

Sixth Day.

Breakfast.

Poached eggs and spinach.
Smoked salmon.
Van Houten's cocoa, made with cream.

Lunch.

Crab omelette. (18)
Cold or hot mutton.
Asparagus.

Dinner.

Sorrel soup.
Cream of veal.
Turkey poult, with French beans.
Cauliflower au gratin.

Recipes.

(18) Crab Omelette.—Break the eggs required into a basin, season with salt, pepper, chopped parsley, and a small piece of chopped shalot; beat well together with a whisk, shred the crab, and mix it with the eggs. Fry in butter in the usual way. Another way is to make the omelette and put the shredded crab inside instead of folding it over.

All kinds of omelettes, excepting sweet omelettes—*viz.*, omelettes with fine herbs, with kidneys, with oysters, with ham, etc., are suitable for diabetic patients.

Seventh Day.

Breakfast.

Kippered herrings.
Grilled bones, with buttered broccoli.
Egg flip. (19)

Lunch.

Mayonnaise of lobster.
Stewed pigeons with mushrooms.
Cauliflowers.
Gruyère cheese.

Dinner.

Julienne soup.
Broiled sole with white wine sauce.
Grilled mutton cutlets with savoury sauce. (20)
French beans.
Lemon sponge.

Recipes.

(19) Egg Flip.—This will be found most useful, especially in those cases of diabetes where there is much dyspepsia, from which the patient suffers particularly in the morning, and is consequently unable to eat a good breakfast. Heat half a pint of milk not quite to boiling point; pour it on to the well-beaten yolk of an egg, stirring

all the time. Add two tablespoonfuls of unsweetened whisky or brandy.

(20) GRILLED CUTLETS are much improved by a good sauce. The following recipe is excellent: Melt a piece of butter on a plate, and add a piece of glaze about the same size as the butter, also a little Harvey, Worcester, anchovy, or ketchup sauce, varying to taste. Well mix with a knife, and spread over the cutlets before broiling. When done, serve with the gravy from the chops.

CHAPTER XXIV.

DIABETES—(*continued*).

A Week's Ménus for a Diabetic.

(*Time—Winter.*)

First Day.

Breakfast.

Smoked salmon.
Kidneys and bacon, on a bed of Brussels sprouts.
Nib cocoa and cream.

Lunch.

Roast grouse.
Baked custard pudding, with bottled green fruit stewed with saccharin. (1)
Brie cheese.

Dinner.

Celery soup.
Red mullet en papillotte.
Spanish steaks. (2)
Tomatoes, with frozen savoury cream. (3)
Russian caviare on gluten croutons.

Recipes.

(1) Bottled Green Fruit.—The fruit—greengages, plums, gooseberries, cherries, currants, etc.—should be gathered when green and unripe, bottled in the usual way, and sweetened with saccharin.

(2) Spanish Steaks.—Take one pound of rump steak, two onions, two ounces of butter, one and a half gills of brown stock hot, half a tablespoonful of tarragon vinegar, and one tablespoonful of cream. Cut the steak into rounds, score them with a knife, sprinkle parsley on the top of each, then put a little butter and vinegar over them; let them stand while the sliced onion is frying in the butter. Strain the steaks, see that no fat is left in stewpan, cover the bottom of it with the hot stock, let the steaks simmer gently in the stock for one

hour, then dish them. Reduce the gravy by stewing to half the quantity, pour it round the steaks, adding the onion before serving.

(3) Cut fresh tomatoes in half, place them on ice till slightly frozen, whip a proportionate amount of cream, mix with it pepper, salt, a little tarragon vinegar, ice and place a dessertspoonful on the cut surface of each tomato.

SECOND DAY.

Breakfast.

Herrings and mustard sauce.
Cold tongue.
Callard's almond biscuits.
Coffee and cream.

Lunch.

Oyster omelette.
Roast loin of mutton with mashed turnips.
Gorgonzola cheese.

Dinner.

Clear soup and grated Parmesan cheese.
Steamed turbot with Dutch sauce.
Braised pheasant with purée of savoy cabbage.
Sea-kale with French butter.

THIRD DAY.

Breakfast.

Cod roes, stewed brown. (4)
Swiss eggs. (5)
Potash water and cream.

Lunch.

Roast rabbit with stewed leeks.
Rhubarb and cream.
Stilton cheese and Callard's cheese biscuits.

Dinner.

Oysters.
Soup, croute au pot. (6)
Roast goose and broccoli.
Stewed celery.
Cocoanut cream. (7)

Recipes.

(4) Fresh COD ROES are rather neglected; they can be purchased for a few pence, and are excellent for breakfast stewed brown. Par-

boil them first; let them get cold; cut in slices, and stew in a rich brown gravy. They make also a light pleasant dish, fried in cutlets.

(5) Swiss Eggs.—Spread two ounces of butter on the bottom of a fire-proof porcelain dish, and lay on it six thin slices of Gruyère cheese; break six eggs on this, keeping the yolks whole. Sprinkle over some mignonette pepper and salt. Mix together a tablespoonful of chopped parsley and two ounces of grated Gruyère cheese. Strew over the eggs. Bake in a quick oven from ten to twelve minutes. Serve in the dish they are baked in.

(6) Croute au Pot.—The croutons must be made of gluten bread.

(7) Cocoanut Cream.—Whip cream and mix fresh grated cocoanut with it; sweeten with saccharin if required.

Fourth Day.

Breakfast.

Fried bacon, served on a purée of Brussels sprouts.
Cold pheasant.
Van Houten's cocoa and cream.

Lunch.

Braised leg of Welsh mutton, with tomatoes and mushrooms. (8)
Cheese cake (9) and cream cheese.

Dinner.

Hare soup, without wine.
Water souchet of sole.
Duck with turnips. (10)
Russian salad (leaving out the potatoes, carrots, and peas).

Recipes.

(8) The mutton is braised as already described. The tomatoes and mushrooms are cooked in the oven with a little butter, and placed round the dish.

(9) Cheese Cakes.—One pint of milk, half a tablespoonful of rennet, one ounce of butter, two eggs, one tablespoonful of brandy, quarter of an ounce of almonds, and saccharin. Turn the milk to a curd; let it stand in a warm place till thoroughly set, tie a piece of muslin over a bowl, break up the curd and pour it on to the muslin; leave it till all the whey has run off. Beat the curd smooth and add the butter and eggs well beaten with the brandy, almonds, and saccharin. When well mixed pour some of the mixture into each of the patty pans and bake for about fifteen to twenty minutes.

(10) Duck with Turnips.—Slightly brown the duck in a flat stewpan with a little butter and onion; then add a pint of good stock

well flavoured with vegetables, herbs, spices, etc. Keep the stewpan well closed, so that the steam does not escape. Simmer gently for one and a half to two hours. Remove the fat from the gravy and serve it with the duck. The turnips are cut in thin slices, fried gently in butter, and served in the dish with the duck.

FIFTH DAY.

Breakfast.

Ham or tongue omelette.
Spiced beef.
Tea and cream.

Lunch.

Larded sweetbread.
Cold mutton with endive salad.
Camembert cheese.

Dinner.

Lettuce soup. (11)
Fried cutlets of cod.
Sirloin of beef with gherkins (12) and stewed Scotch kale.
Devonshire junket. (13)

Recipes.

(11) LETTUCE SOUP.—This is made the same way as spinach soup, only winter lettuce is used.

(12) SIRLOIN OF BEEF WITH GHERKINS.—Roast the beef; when half cooked add the vinegar from a bottle of gherkins to the dripping, and baste constantly. Chop the gherkins quite small, and place them round the dish in the gravy when served.

(13) Make the junket in the usual way; add a solution of saccharin to the whipped cream. The succharin must not be added to the milk, else the rennet will not make curds.

SIXTH DAY.

Breakfast.

Stewed mushrooms.
Cold fowl.
Boiled eggs.

Lunch.

Oxtail haricot.
Coffee cream.

Dinner.

Oyster stew.
Marinaded venison cutlets.
Boiled guinea-fowl, with celery sauce.
Little tarragon creams. (14)

(14) Put into a basin one white and two yolks of eggs, a quarter of a pint of cream, a little white pepper and salt. Beat up well with a fork till smooth, and add a little chopped tarragon. Butter some little dariole moulds and sprinkle them with chopped tarragon and truffles mixed. Pour in the cream mixture, and stand the darioles in a stewpan of boiling water reaching to three-quarters of the height of the moulds. When the water boils draw the pan to the side of the stove and poach for about twenty to thirty minutes till the creams are set. Turn out on to a warm dish, and serve with cream sauce round them. The cream sauce is prepared by putting into a stewpan one oz. of butter, two raw yolks of eggs, four tablespoonfuls of thin cream, a pinch of salt, and three or four drops of lemon juice. Stir in a bain-marie till the sauce thickens, add a saltspoonful of tarragon vinegar, and strain it. Mix in a light sprinkling of fresh tarragon and serve. This cream sauce will be found nice to serve with fillets of soles, whiting, etc.

SEVENTH DAY.

Breakfast.

Finnan haddock.
Cold brawn.
Cocoatina and cream.

Lunch.

Boiled calf's head.
Turnip tops.

Dinner.

Clear soup with poached eggs.
Fried cutlets of plaice.
Roast turkey. Broccoli sprouts.
Fish-roe soufflés. (15)

Recipe.

(15) FISH-ROE SOUFFLÉS.—Take six soft roes of fresh herrings; blanch, pound, and tammy them; then flavour with salt, pepper, powdered mace and nutmeg; add half an ounce of butter and the yolks of two eggs; beat well together; whisk the whites of six eggs into a stiff froth, mix same with the roes, and bake in rammakin cups for about five minutes. Serve immediately the soufflés are removed from oven.

From the above *ménus* and recipes it will be seen that

the diet of a diabetic need not be monotonous and repulsive. All that is necessary is to study cookery books, to eliminate all starch and sugar from the recipes, and to make experiments to see if good dishes can be made by substituting saccharin for sugar, and almond flour for starch, or by omitting it altogether.

CHAPTER XXV.

DIABETES—(*continued*).

Carlsbad, Marienbad, Vichy.

Carlsbad has been called "the hospital for diabetics". It is a hospital, however, of which the walls are the pine-clad hills, the roof the sunny sky, and the medicine the hot bubbling streams. At Carlsbad, the dietetic treatment of diabetics is carried out under the most agreeable and revivifying conditions.

The town of Carlsbad lies in a narrow winding valley, through which flows the stream of the Tepel. The houses climb the hills on either side; and it seems to have been hard to find level spaces for the Curhaus, and the concert and promenade rooms. At certain spots in the shallow river, hot saline water is seen bubbling up through the crust of the earth and mixing with the stream. One of these hot springs, called the Sprudel, shoots high into the air, while others bubble up slowly into wells and reservoirs.

All the Carlsbad waters contain the same alkaline ingredients in almost identical proportions; they vary only from one another in the amount of carbonic acid they contain, and in the temperature at which they come to the surface. This temperature varies from 100 deg. to 166 deg. The principal salts they contain are sulphate of sodium, chloride of sodium, carbonate of sodium, and carbonate of calcium. The springs are believed to be derived from a common source seven to eight thousand feet below the surface of the earth. In fact, Carlsbad may be considered to be set down over an immense cauldron of boiling water, which is forced up under the pressure of the

steam through cracks and holes in the earth's surface. The water is very agreeable to drink, and has been compared to rather salt chicken broth.

Life at Carlsbad is framed to be free of care, and as diabetes is frequently caused by over-anxiety of mind and the worry of life, it may be conceived that to be relieved altogether from the causes of the malady may alone effect the cure. On arriving at Carlsbad one is immediately visited by the tax collector, who demands a tax of from four to fifteen florins from every visitor according to his means. With the money obtained from this universal cure-tax, the immense forests which stretch for miles round about Carlsbad are maintained as public gardens; two bands of the best reputation, and composed of highly-trained performers, are engaged to give music all day long to the visitors; the theatre is subsidised, and the Curhaus and promenade rooms are kept up. Lodgings can be obtained at Carlsbad at every price. The usual course of life is as follows.

At the wells.—Called early, the visitor is out in the fresh morning air by six o'clock at the latest, and with a glass cup suspended by a leather strap across his shoulder, he takes his way to the great Curhaus which covers the spouting waters of the Sprudel, or to the wells of the Schlossbrunn, Mühlbrunn, Elizabethquelle, or Neubrunn, as he may be directed by his physician. He joins the *queue* at the well, and in turn hands his cup to be filled by one of the neat little maidens whose duty it is to charge the glasses. Waiting until the water is cool enough to drink, it is slowly sipped, while the delightful strains of Labitzky's band are enjoyed. A short walk of about twenty minutes is then taken either up and down the covered promenades of the Curhaus, or among the flower-beds of the Stadtpark. In the course of two hours three or four half-pints of hot water have been drunk, and three or four miles have been walked.

Breakfast.—By this time one feels not disinclined for

breakfast; but rigid abstemiousness is the rule of life at Carlsbad, and though one might feel capable almost of eating a mutton chop or some ham and eggs or fish for breakfast, it is not allowed. Cheerfully submitting to the doctor's orders, the many visitors are seen trooping into the various bakers' shops, and purchasing their frugal breakfast in the form of a couple of "crescents," or some of the admirably made diabetic cakes. With these in a paper bag the patient betakes himself to one of the many little tables set out under the trees of the restaurant gardens; where breakfast is made, from coffee, the bread purchased at the baker's, with perhaps a single boiled egg, or a few slices of German sausage.

Bathing.—After breakfast the papers of the day are leisurely read, and at about eleven o'clock the operation of bathing is gone through. The baths are of different kinds, hot saline baths and vapour baths; but the characteristic bath of Carlsbad is the peat bath. This consists of black peat pulverised, then screened and freed from accidental impurities and mixed with hot Sprudel water. After lying in this mixture for some time the patient takes a dip in a bath of clean water. The effect of the peat bath is said to be stimulating to the skin and sedative to the nervous system.

The midday meal.—The patient will then go home and rest for a while, till at about one o'clock the pangs of hunger become irresistible. He betakes himself to one of the many large airy restaurants furnished with balconies or shady gardens, where he can take his midday meal in the open air. Dinner is frugal and strictly *kurgemäss.* It may consist of a course of fish, meat, or fowl, the orthodox green vegetables and cheese, with a single glass of lager beer or claret; no bread or sweets are allowed.

The afternoon is spent in strolling along the beautiful paths of the forest, or in walking through the valley to one of the gardens, where a delightful classical concert given by

Labitzky's band may be enjoyed, while sipping coffee under the shade of the trees.

The evening meal is taken about seven, and consists of a bowl of bouillon or a couple of poached eggs, or some dish making an equally light repast. For those who are well enough, and who can enjoy social pleasures, there is an excellent theatre and frequent dances at the Curhaus from eight to twelve, at which visitors are expressly requested to attend *en toilette de ville*. Most patients, however, seek their beds at about nine o'clock, having been sufficiently tired out by this idle day of drinking water, bathing, and taking pic-nic meals to the strains of an excellent band.

The influence of this peaceful life and the strict diet enforced on the diabetic patient is quite remarkable. It is ascribed by many to the waters; but it is, I believe, a fact that these waters may be taken at home, where the patient is subjected to the usual worries, anxieties, and work of daily life, and they will not produce the same result as when taken whilst he is living a quiet, open-air life, free of care, in Carlsbad. The cure is, in fact, not only a water cure, a bath cure, and a diet cure; but a music cure, a fresh-air cure, and a *laissez-aller* life cure. In a very short time these beneficial influences are felt. The diabetic loses his dyspepsia, his depression of spirits, and his extreme thirst, and he gains strength and begins to feel again that life can be enjoyed.

Careful daily examinations of the urine show at the same time that the percentage of sugar steadily diminishes; in fact, in most cases of diabetes minor it will entirely disappear in the course of three or four weeks' treatment. The cure is, however, not a permanent one; it is generally necessary for the patient to return to Carlsbad every year. In fact, the remembrance of freedom from his troubles becomes, as soon as they return the following year, persuasion enough to induce him to think of another visit to the springs. Men occupying responsible and important public posts have

been known to be visitors at Carlsbad for twenty, thirty, and even forty years in succession, thus preserving their health and their possibilities of public usefulness and of personal enjoyment of life, by an annual stay of three or four weeks at Carlsbad.

MARIENBAD is nineteen miles south of Carlsbad, and its waters closely resemble those of Carlsbad, excepting that they are of a much lower temperature, ranging from 43° to 50° Fahrenheit. The springs were first brought into notice in 1870 by the abbot of the convent of Tepel, and since then Marienbad has become a very fashionable resort, and is crowded in the summer with visitors. It is preferred by some to Carlsbad, owing to the fact that it is situated on a hill 2000 feet above the sea level, instead of in the defiles of a narrow valley like Carlsbad. The air is fresh, in fact at times even chilly; but the beauty of the environs, the extent and variety of the walks through the forests, and the general gaiety of the place, make Marienbad one of the favourite spas of Bohemia.

VICHY is another spa greatly resorted to by diabetics. It is eight hours by rail south of Paris, and is situated in a pleasant valley 800 feet above the sea level on the bank of the river Allier. The waters are alkaline, and contain a large amount of bicarbonate of sodium. They vary in temperature. Some are hot, others nearly cold. The waters come from immense underground reservoirs, which may be visited by passing along dark subterranean passages. The effect of drinking these alkaline waters daily, seems to be to maintain the fluids of the body in an alkaline condition, to promote oxidation and quicken tissue change, and to improve assimilation. Thus they have the opposite effects of fattening the thin and thinning the fat; the former by improving digestion, increasing assimilation, and aiding the formation of flesh; the latter by rapidly oxidising inert and unnecessary fat tissue.

The influence of Vichy waters on diabetes is often very marked. In 100 cases treated by Barthey, fifty lost all

traces of sugar ; in sixteen it was greatly diminished ; while in thirty-four it remained stationary, although digestion was improved. Slight cases of diabetes improve greatly at Vichy, but more severe cases require protracted treatment and frequent return to the spa. The dietetic treatment is strictly enforced at Vichy, but there is much to amuse and distract the patient, and to make his period of "cure" pass pleasantly.

CHAPTER XXVI.

GOUT.

GOUT seems to be the most ancient, the most persistent, and still the most incomprehensible of diseases. Its origin, its cause, and its cure are almost as little understood now as in the time of the Romans. Any number of views have been promulgated ; but after reading them the poor student in search of knowledge is more confused than he was before, when he held the simple and popular opinion that chalk stones meant gout, and that colchicum relieved the attacks. Among many opinions, that of Dr. Todd seems to be the most practical, when he says : " There is no disease in which the patient can do so much for himself, or in which the prescriptions of the physician are of so little avail without the full and complete co-operation of the patient, as in gout."

Causes of gout.—So far as we understand gout it seems to be caused by a want of balance between the intake of food and the power of the body to oxidise and utilise it, and it can be controlled by the patient checking the consumption of food, and taking means to promote oxidation. Let me explain. It will be remembered that when I described the part played by albumen in metabolism, I showed how albumen and the foods containing that substance are oxidised in the body (*vide* chapter i., page 5). After yielding the nitrogen necessary for the reconstruction of the vital fluids of the body, the final product of albumen is urea, which is separated from the blood by the action of the kidneys, and being very soluble, it is dissolved in the urine, and cast out of the body as a waste product.

Uric acid formation in gout.— Now, it can easily be

understood that if by some fault in the organism the oxidation of albumen is not completed and carried on to the final production of urea, but stops short at the production of a less highly oxidised substance, namely, uric acid, there will be a disturbance of the ordinary course of action in the body (*vide* chapter xxviii., page 166). This uric acid is not, moreover, soluble like urea, and cannot be carried off by the kidneys with the same facility, being an insoluble and intractable substance. It exists in the form of small pointed crystals, which cause irritation of the urinary passages. Circulating in the blood, uric acid enters into combination with the sodium of the serum, and forms acicular crystals of urate of sodium, which are deposited in the membranes of the joints, giving rise to the well-known symptom of gout, namely, chalk stones. The attacks of gout are caused by an effort of nature to get rid of these deposits of a foreign substance in the joints; the joint becomes acutely inflamed, there is an increased flow of blood to the part, and urate of sodium is discharged into the blood current.

The want of physiological balance in gout.—Now, it will be understood that, if by some inherited or acquired vice of the constitution the gouty person has not the power of oxidising the amount of food ordinarily taken, there will consequently be a want of balance between the consumption of food and the elimination of waste products, with the inevitable result that a quantity of effete and injurious material remains circulating in the blood. The person threatened with gout must, if he would be healthy and wise, ascertain by careful observation and experiment the exact amount of food which his body has the power of oxidising, or he should by increased exercise and fresh air so stimulate oxidation in the body that the balance can be restored and maintained. There is no doubt that this can be done; but the gouty person must, if he would be free from the attacks of his malady, become an ascetic in the matter of eating and drinking.

The intake of food should be strictly limited. — The gouty person should never eat to satiety, but only enough to maintain strength and to restore the waste of the body. It is difficult to lay down any hard and fast rule on the question of the amount of food to be taken, as it would depend in a great measure on the amount of exercise taken daily. This is, therefore, a matter which the patient must decide for himself after careful observation. I am acquainted with a vigorous old gentleman of eighty-eight, who successfully keeps the attacks of gout to which he is liable, at bay, by a frugal and scientific dietary. He breakfasts on fruit ; at mid-day he takes a small meat meal consisting of four ounces of meat if he has walked twelve miles in the previous twenty-four hours, and of two ounces of meat if he has only walked six miles. His evening meal consists of baked apples, custard pudding, or some similar light dish. On this simple dietary, combined with active exercise, this octogenarian is able to live a busy public life, to be alert in mind and vigorous in body, and to ward off the gout which would have killed a more self-indulgent person.

The Kinds of Food to be Taken and Avoided.

Foods containing starch and sugar should be avoided or taken in moderation. As already explained, starch is turned into glucose or sugar by the process of digestion, so that starch and sugar may be considered to have the same effect. Why sugar should have so deleterious an effect on the gouty is ill understood ; but it is the common experience of gouty persons that sugar is poison to them. It is supposed that as starch and sugar are more easily and rapidly oxidised in the body than albumen, and as in the gouty the power of oxidation of foods is impaired, if the usual mixed diet of foods containing albumen, starch, and sugar be taken, the body will seize on the more easily oxidisable starch and sugar, while the albumen will remain partly oxidised, thus causing the production of urate of sodium in

the blood, which, as I have shown, is the cause of gout. For the same reason **fatty foods should be taken in moderation.** They rapidly undergo acid fermentation in the stomach, and become, in some measure, the cause of the "acidity" so much complained of by gouty subjects.

The diet should be limited to beef, mutton, chicken, game, fish, eggs, green vegetables, a few ounces of stale bread, and a small quantity of butter (Roose). Fruit may be allowed, if not too sweet, and if found by experience not to disagree. Tea and coffee should be used in moderation. Cocoa made from nibs is recommended. Milk is ill-tolerated by some; but in other cases from one to two pints a day can be taken with advantage. Pastry of all kinds is forbidden. Bread, rice, potatoes, beans, and peas, all of which contain a large amount of starch, should be taken only in small quantities. **The gouty person should not therefore be a vegetarian;** for the vegetarian, in order to obtain the amount of albumen necessary for tissue change in the body, is obliged to take with it a large amount of starch, as vegetable albumen is contained in beans and peas, which are full of starch. **The gouty person should, however, be a total abstainer,** for it is indisputable that alcohol in any form is injurious. Excessive beer drinking is often the cause of gout among the poor, while a long course for many generations of "high living" is the fruitful source of gout among the well-to-to. If the enfeebled digestive powers need the stimulus of alcohol, old brandy or whisky well diluted, or good claret or hock, are the most suitable and least injurious drinks. Water is the only article of diet the gouty may take in excess. It is well for him to drink an abundance of water, either hot or cold as he may prefer. Water washes out the tissues, augments secretion, and, by removing waste products, may prevent deposits of uric acid and urate of sodium. The various effervescing alkaline waters may often be substituted with advantage for plain water, and, as lime juice is recommended to those who are unable to take vegetables, a

lemonade made of an effervescing alkaline water with lime juice and saccharin will be found a most refreshing and agreeable drink.

Exercise and fresh air.—It is important not only to limit the amount of food to be oxidised and disposed of in the body, but to increase the power of oxidation. This is best done by exercise and fresh air. Exercise stimulates the circulation, promotes tissue change and increases oxidation in the body ; hence it is obvious that the maintenance of that delicate balance between the food taken and the oxidation of that food, which is so necessary for the gouty, can be greatly aided by exercise. The exercise must not, however, be too violent and fatiguing, for anything that tends to depress the nervous powers may cause an attack of gout. Undue excitement, sleeplessness, overstudy, anxiety, should, therefore, all be avoided by the gouty. If, owing to stiffness of the joints, active walking or horse exercise cannot be taken, passive exercise should be resorted to, such as can be obtained by means of massage. Fresh air is of great importance, though damp and cold should be avoided. Great benefit may be obtained by a sojourn in a warm dry climate, such as that of Las Palmas in Grand Canary or Orotava in Teneriffe. Fine hotels and the best medical attendance can now be found at these health resorts ; and it will, I think, not be long before the martyrs to arthritic gout will learn that the "Fortunate Islands" may be to them a discovery worth making.

CHAPTER XXVII.

DISHES FOR THE GOUTY.

A Week's Ménus.

First Day.

Breakfast.

A boiled egg and dry toast.
Cocoa from nibs with added milk and sweetened with saccharin. (1)

Lunch.

Baked apples and custard pudding.
Lime-juice lemonade. (2)

Dinner.

Tomato soup.
Roast chicken and asparagus.

(1) The discovery of saccharin has been as valuable to the gouty as to the diabetic. It should be used in the place of sugar.

(2) This is an excellent drink. It is made with Apollinaris or soda water, to which is added one teaspoonful of lime juice and a tabloid of saccharin to the pint.

Second Day.

Breakfast.

Grilled sole with lemon juice and butter.
Tea and toast.

Lunch.

Stewed cabbage. (3)
Stilton cheese and rusks.

Dinner.

Bisque soup.
Mutton cutlets and French beans.
Junket.

(3) Take a good-sized savoy, or spring cabbage; cut, wash, and use only the heart; boil it for a quarter of an hour. Meanwhile take

two ounces of fat bacon chopped fine, a little onion and parsley, and a few herbs. Brown together in a stewpan. Put into the mixture the boiled cabbage and stew all together for about three-quarters of an hour.

THIRD DAY.

Breakfast.

Eggs with black butter.
Fresh fruit.
Coffee and toast.

Lunch.

Artichoke soup. (4)
Sardines on toast.

Dinner.

Oysters.
Fillet of beef au printanière and potatoes.
Stewed rhubarb and cream.

(4) The various soups made of vegetable *purées* are excellent for gouty patients. They are sufficiently sustaining to prevent a feeling of hunger, and if well digested give a fair amount of nourishment.

FOURTH DAY.

Breakfast.

Fried cutlets of cod.
Milk and soda water (5), toast.

Lunch.

Banana fritters.
"Cart-wheel" (6) and pulled bread and butter.

Dinner.

Spinach soup.
Roast pheasant and broccoli.
Almond pudding. (7)

(5) Milk is often found to be more digestible if diluted with an alkaline effervescing water. So treated, it makes also a more agreeable drink than when taken pure. Should the physician proscribe milk, cream and aerated water will be found to make a most nutritious and agreeable drink, particularly for breakfast, if tea and coffee cannot be taken.

(6) This is a cheese which owes its name to its immense circular size. It is made of skim milk, and is thus free from fat. In cases when the richer cheeses cannot be well digested, "cart-wheel" may form a useful food for the gouty.

(7) The recipe for this has already been given.

Fifth Day.

Breakfast.

Poached eggs on toast.
Tea.

Lunch.

Boiled sole.
Tomato salad.

Dinner.

Victoria soup.
Roast grouse.
Asparagus.

Sixth Day.

Breakfast.

Cold ham.
Melon.

Lunch.

Stewed plums and rice.

Dinner.

Boiled chicken with potatoes sauté.
Cauliflower au gratin.

Seventh Day.

Breakfast.

Finnan haddock.
Nib cocoa and milk, toast.

Lunch.

Cock-a-leekie soup.
Cheddar cheese and Callard's biscuits. (8)

Dinner.

Cutlets of salmon.
Roast mutton with potatoes and cauliflower.
Gooseberry fool.

(8) Callard's biscuits and cakes are as useful to the gouty as to the diabetic. They are carefully and intelligently made, are free from starch and sugar, but yet very pleasant to eat.

CHAPTER XXVIII.

URIC ACID AS A CAUSE OF DISEASE, AND ITS PREVENTION BY DIET.

WHEN explaining the part played by albumen in the food supply of the body, it will be remembered that I described how the albuminoids, composed of oxygen, hydrogen, carbon, and nitrogen, yielded up their nitrogen in the process of oxidation in the tissues, which nitrogen is absolutely required for the formation and reconstruction of the tissues and juices of the body without exception : hence the neces sity for a certain amount of albuminous food.

How urea and uric acid are formed.—Now, the final product of oxidation of albumen is urea, which is separated from the blood by the action of the kidneys, and, being a very soluble substance, it is dissolved and cast out of the body in the urine. Not all the albumen, however, is oxidised into urea ; a small proportion never reaches that state, and remains only partly oxidised in the blood and tissues in the form of uric acid. Uric acid is soluble in an alkaline fluid, and much less soluble in an acid fluid. If, therefore, by any cause the alkalinity of the blood is decreased, the uric acid present may be driven out of the blood current and deposited in the joints, liver, spleen, etc. When subsequently the normal alkalinity of the blood is re-established, the uric acid which has been driven out is washed again into the current, and is therefore present in excess. An excess of uric acid in the blood produces the symptoms of depression of spirits, irritability of temper, headache, and malaise.

Uric acid the cause of headache.—This whole subject has been very carefully studied by Dr. Alexander Haig,

and the results of his inquiry are embodied in a book called *Uric Acid as a Factor in the Causation of Disease*. Dr. Haig was led to study this subject by an extremely severe and periodic headache from which he suffered almost every week, and which, from its painful violence and incapacitating character, threatened to cripple or cut short his career. Seeking its cause in order to accomplish its cure, he began to carefully examine the excretions of the body, and he arrived at the following interesting results. A headache occurred when there was an excess of excretion of uric acid following on a period when there had been a diminished excretion. Uric acid was excreted in excess when the urine was increasingly acid, and presumably, therefore, when the alkalinity of the blood was high. The excretion of uric acid corresponded with the severe headache, and, consequently, with the increased alkalinity of the blood and the increased acidity of the urine. Now what are the conditions which alter the alkalinity of the blood and the solubility of uric acid and the consequent excretion of the latter by the kidney? Cold decreases the alkalinity of the blood, and drives the uric acid into the joints and tissues; warmth and acid perspiration increase alkalinity, and the uric acid is then washed out of the joints and tissues into the blood; good dinners and generous wines decrease alkalinity, which is followed by a reaction and falling acidity. Dr. Haig found that by administering an acid to himself he could drive away his headache, by, in fact, driving the uric acid circulating in the blood into the joints and producing pain and pricking in these; or he could bring on the headache at will by giving himself a dose of alkali, when the uric acid deposited in the joints and tissues was washed out of them into the blood. It was the presence of an excess of uric acid or urates in the blood, he therefore argued, which caused the headache. He contends that what our forefathers called "phlegm and humours," what the unscientific call "bile," and what the doctors label gout or rheumatism, are all manifestations of

the same condition, namely, an excess of uric acid in the system.

Decreased excretion of uric acid causes symptoms of gout, "bile," and headache.— He believes, however, that this excess is not due to excessive formation of uric acid, but to decreased excretion. The formation of uric acid is, Dr. Haig states, always as compared to urea as 1 to 33. If, therefore, a person excretes on an average 500 grains of urea a day, he should also excrete about 16 grains of uric acid. If this amount is not excreted it is because it is retained in the body, and will either be found subsequently in the deposits of urate of soda or chalk stones in the joints in gout, or it will be excreted when from some cause the alkalinity of the blood has been raised with the accompanying symptoms of headache, depression, and rheumatic pains. Dr. Haig does not deny absolutely that an excess of uric acid may be formed by deficient oxidation ; but his investigations lead him to believe that urea and uric acid are produced always in the same proportions, and if we want to diminish the one we must diminish the other. They rise and fall together.

Treatment by vegetable diet.—Having arrived at the cause of his periodic headaches, and having formed the opinion that in order to prevent them the formation of uric acid must be diminished, and the high alkalinity of the blood maintained, what was the process of cure adopted? A change of diet. And it is for this reason that Dr. Haig's researches on a rather abstruse subject are particularly interesting to us. His object was to decrease the formation of urea and uric acid, and to keep up the alkalinity of the blood, so that the uric acid formed should be held in solution and steadily excreted daily by the kidneys, instead of being driven into the joints and tissues. An animal diet increases acidity, a vegetable diet diminishes it. Dr. Haig succeeded in curing his headaches by reducing the intake of nitrogenous food and by putting himself on a vegetable diet. In this way the excretion of urea was de-

creased from an average of 500 grains to 300 grains a day, and of uric acid from 16 grains to 9 grains. The alkalinity of the blood was maintained, the old stores of urates were washed out of the tissues, and when the exact balance was arrived at, and the uric acid daily produced was daily excreted, the headaches ceased.

"Bilious headache."—Dr. Haig argues that not only the so-called "bilious headache," but also gout, rheumatism, and epilepsy are caused by excess of uric acid in the blood, and may be controlled by limiting the consumption of animal food and putting the patient on a farinaceous diet. With respect to epilepsy, he considers that the fits are caused by the same condition which produces periodic bilious headache in others. Dr. Haig conclusively shows that an excess of uric acid in the blood profoundly alters the circulation, and interferes with tissue change and nutrition, which finally result in serious organic disease.

Mental depression.—We are all acquainted with those unfortunate persons who, though they are possessed of all the good things of this world, though they have within their reach the pleasures which wealth can give, and the comforts and enjoyments of home and family, yet persist in thinking that life is not worth living, that ruin haunts their steps, and that the affection of friends is not for them. These are the victims of uric acid in the blood, or what is called uric-acidæmia. The condition is graphically described by Dr. Haig: "Self-reliance is absolutely gone, extreme modesty is common, or even habitual, a feather weight will crush one to the dust, and even the greatest good fortune will fail to cheer. If roused from such a condition a considerable amount of irritability and bad temper is sure to be manifested, quite out of proportion to the requirements of the case. . . . Clear the blood of uric acid . . . and the mental condition alters as if by magic; ideas flash through the brain, everything is remembered, nothing is forgotten, exercise of mind and body is a pleasure, the struggle for existence a glory, nothing is

too good to happen, the impossible is within reach, and misfortunes slide like water off a duck's back."

The daily dietary to ensure cure.—In order that this blessed result may be obtained by these sufferers, Dr. Haig lays down the following *régime* to be adhered to :—

Animal Food.—Milk, 1 to 1½ pints, previously boiled. Eggs, fish, fowl, or game, 1 to 4 oz., varied a little from day to day.

Vegetable Food.—Vegetable prepared products, vegetables twice a day, fruit three times a day, to any desired extent, according to appetite.

Tea, coffee, cocoa in moderation, and as flavourings rather than as strong decoctions.

The daily dietary may be as follows :—

Breakfast.—A large soup plate half full of porridge eaten with milk; a few mouthfuls of fish or egg prepared in various ways; one or two rounds of bread, or its equivalent in toast, with plenty of butter; a cup of milk, flavoured with tea, coffee, or cocoa, previously boiled. Finish with a small quantity of any fruit that is in season.

Lunch.—Potato and one other vegetable cooked in various ways and eaten with butter, fat, or various sauces; pudding, tart, or stewed fruit; biscuit and butter; a little fruit as at breakfast. For drink, a little milk, which in winter is often warmed, or water, often taken in summer, with a little fruit syrup, such as Stowers' lime juice cordial.

Afternoon Tea.—Bread and butter and cake of various kinds. A little milk and water flavoured with tea.

Dinner.—Soup made without meat stock; fish, of which only a very small piece is taken; two vegetables with sauces, butter or fat; any ordinary pudding, tart, or stewed fruit, though not as a rule very rich dishes containing many eggs; biscuit and butter; a good supply of various fruits for dessert. For drink, water with syrup, aerated waters, or a little milk, often taken warm in winter; a tumbler of water, aerated water, or in winter hot water at bed time.

Dr. Haig's opinions on vegetarian diet.—As Dr. Haig states, there is no starvation about this diet; but it has its inconveniences, owing to its running counter to the accepted habits and customs of the country. A mutton chop is always obtainable, while well-cooked vegetables can rarely be got anywhere. But health is worth purchasing at the

price of inconvenience and trouble. With an earnestness born of conviction, Dr. Haig asks: "Do we not here in England die younger and in greater number than there is any necessity for? Are we not afflicted with an infinite number of diseases which cause far more pain and misery than is at all necessary? Are we not given to all kinds of debauchery and excess, and have we not huge asylums full of lunatics, and prisons full of criminals?" And he replies to his own queries: "I look upon all these things as serious and widespread diseases of the human race; and as I am not one of those who believe that Nature herself, if she had a free hand, would tend to destroy us, but rather to preserve what is good and eliminate what is evil; and, further, cannot believe that the tendency to these evils is part of the ground plan of Nature's work, or that the unalterable bias is to have headache, epilepsy, mental depression, mania, and their results—murder or suicide, alcoholism, morphinism, cocainism, etc.,—and is originally implanted in our nerve centres, I am driven to the conclusion that not a few of these evils are the result of unnatural conditions, and that prominent among these is the unnatural diet, the evil action of which we are now in a position to follow out completely through our knowledge of the powerful effects of urates on the functions and nutrition of the whole body." This is a strong denunciation of the meat-eating habits of our race and country.

CHAPTER XXIX.

CONSUMPTION.

CONSUMPTION was once thought to be both an incurable and an unpreventable disease. It came mysteriously ; it often attacked the youngest and the fairest ; it destroyed promising careers ; and unless it could be checked by the exile of the patient to a warmer climate than England, its cure was thought to be hopeless, and death sooner or later inevitable. Of late years some considerable progress has been made in respect both to its prevention and to its successful treatment. The disease has by the researches of Koch been shown to be due to the ravages of a minute bacillus in the tissues. The effort of medicine in the treatment of consumption is first to make the tissues resistant, and next to cut short the life of the bacilli or to limit their power for evil. This end is mainly accomplished by the following means—giving the patient sunlight and fresh air, regulating the diet, next by the application of antisepsis.

The tubercle bacillus.—Before proceeding to point out how these objects can be attempted, I will describe the appearance and life history of the tubercle bacillus. If a beam of sunlight fall through a chink of a shutter into a darkened room, a number of motes will be seen to be floating about in it. These motes, made visible by the strong light, are present everywhere in the atmosphere in countless numbers. If they be allowed to settle and are examined under a microscope, it will be seen that they are composed of particles of dust and of minute rod-like bodies or bacilli. These bacilli, though simple in structure and closely resembling one another in shape, are yet so dissimilar in

their action and life that they require certain soils and certain conditions in order to grow and multiply. It is probable that the tubercle bacillus, pictured in Fig. 11 is very largely distributed in the atmosphere; and if taken in with the breath it may settle on and grow in the lungs, and produce phthisis or consumption. If taken with the food it may settle and grow in the intestines and produce consumption of the bowels; if introduced into the brain it may cause tubercular meningitis, and if it finds its way into the marrow of the bones it may cause abscesses of them. In order, however, to grow in the human body the tubercle bacillus must find the right soil, exactly in the same way as a seed will not sprout unless it falls on the right soil. The conditions which produce in the tissues of the lungs or elsewhere, the nidus or soil proper for the growth and development of the tubercle bacillus, are probably in some measure hereditary, and also largely due to environment. The rebreathing of expired air, damp conditions of soil and defective nutrition may be set down as predisposing causes. Why one person should contract consumption and another should not is not fully known. Once, however, the tubercle bacillus is established in the tissues of the air vessels of the lungs, it undergoes rapid multiplication. By its irritating presence inflammation is set up, the tissue breaks down into pus, and cavities are ultimately formed in the lung. The patient becomes emaciated, loses strength, and finally dies from exhaustion or from insufficient aeration of the blood, owing to the fact that a large part of the lung has broken down and has been spit up in coughing.

FIG. 11.—THE TUBERCLE BACILLUS, MAGNIFIED 1000 TIMES.

The **aims of treatment** in pulmonary consumption are to improve the health and render "the soil" for the bacillus more resistant, to combat and conquer the bacillus, to deprive it of its proper nutriment, and, if unable to kill it outright, to render it weak and powerless to work mischief. It is,

unfortunately, not yet known positively what substances are destructive of the life of the tubercle bacillus, but there is some reason to believe that oil and soda salts are antagonistic to its life. Hence probably the well-known benefits which result from the use of cod-liver oil. How the oil acts is by no means clear. The opinion of Hughes Bennett, by whom its use was introduced, was that it prolonged life by improving the nutrition of the tissues. It is now suggested by others that the oil, by being burnt up in the body, absorbs the oxygen required for the active multiplication of the micro-organisms. What we do know, however, is, that if wasting can be checked, and the weight of the patient increased, the tubercle bacillus is often successfully combated.

Treatment by super-alimentation.—A consumptive patient should be carefully weighed at frequent and regular intervals; if he gains weight it is well, but if he loses, a serious effort must be made to induce him to take more food. Sometimes, if the fever is high and continuous, appetite is destroyed, and there is even a distaste for food. In such cases many French physicians, following Dr. Débove of Paris, recommend forced feeding, and the introduction of food into the stomach by means of the œsophageal tube. They report that under this treatment the patient recovers appetite, rapidly gains in weight, his strength increases, and the cough, expectoration, and night sweats disappear. Without resorting, however, to these heroic methods, a patient can with advantage be "overfed" in the normal way. Care should be taken to give him as much fatty foods as he can possibly digest, and far more than enter into the usual dietary. Bread and butter, cream, cocoa, chocolate, and milk are all excellent foods for a consumptive, as well as the usual articles of a healthy dietary. When cream is not well borne, it may be rendered more digestible by adding to each wine-glassful a teaspoonful of brandy, kirsch, or rum, with or without hot water. Milk may be rendered more digestible by

adding to each tumblerful, about six grains of bicarbonate of soda, and five grains of common salt dissolved in two tablespoonfuls of hot water. Malt extract is also very useful in facilitating the digestion of farinaceous foods.

The treatment by Koumiss.—Koumiss is fermented mare's milk, and has long been a favourite beverage with the Tartars and other Asiatic tribes. In Russia consumptives go to certain stations on the Caspian Sea to undergo the koumiss cure. The secret of the whole thing is that koumiss is milk slightly fermented, and consequently highly digestible, large quantities of which can therefore be taken without producing dyspepsia. The Russian mode of cure is to rise early and to take a glass of koumiss every half-hour, with the exception of the two hours preceding dinner and supper. Meat and fats form the chief part of the meals; sweets, fruits, and salads are forbidden, as well as ices, coffee, and spirits. Koumiss is made in Europe from cow's milk. It is particularly appropriate in cases where the temperature is high and the appetite impaired.

The treatment by powdered raw meat.—An excess of food can be given to a consumptive more easily by administering powdered raw meat than by any other method. Dujardin Beaumetz, who was an advocate of this method of treatment, recommended that the powder should be prepared from the lean of beef, which is cut into small pieces and dried in a water bath. When thoroughly dried it is reduced to powder in a coffee mill. The powder may be taken either with lentil flour in the form of soup, or with milk or rum punch. In this way an amount of powdered raw meat representing several pounds of meat can be taken daily. Abundant food would be, however, of little use if not combined with an abundance of fresh air. The aseptic stimulating air of the mountains, as at Davos, the ozone and revivifying breezes of the ocean, the sunlight and warmth of the South, Torquay, the Riviera, and Orotava, are all invaluable in the treatment of consump-

tion. In fact, in some cases, warmth, sunlight, fresh air and the aseptic atmosphere of high altitudes, are sufficient to arrest the tubercular inflammation and to effect a cure. This result is probably due to the fact that the increased vitality of the patient, induced by placing him under healthful conditions, enables him to resist the destructive action of the microbes.

Tubercle bacillus conveyed by milk.—There is no doubt that the tubercle bacillus can be conveyed to the human subject by milk from tuberculous cows, and that children have been infected in this way and have lost their lives. It is therefore a wise precaution to boil the milk taken by children; indeed, when the source from which it is obtained is not known it is absolutely necessary to do so.

That consumption can be caught by the healthy from a consumptive patient is now a well-authenticated fact. The tubercle bacilli abound in the expectorations of the consumptive, which should not, therefore, be spit on to the floor or ground and left to dry, for in this way the bacilli are disseminated in the atmosphere, and if then inspired into the lungs may induce consumption in the nurse or attendant. Hence it is of the utmost importance that the expectorations of consumptives should be spit into covered vessels, that they should be carefully collected and burnt, and that similar precautions should be taken in the home and in the sleeping apartment. A healthy person should never sleep in the same bed with a consumptive.

CHAPTER XXX.

RICKETS.

RICKETS was at one time thought to be a disease of the bones; it is now known to be a general disease caused by malnutrition, and which is almost always preventable. The well-known changes which take place in the bones are but the signs and symptoms of a constitutional condition. Rickets in the child is the incontrovertible sign of ignorance, neglect, or incompetence in the mother or nurse. A mother should be as ashamed of her child having rickets as of its having vermin. Both mean neglect of maternal duties. The neglect may be, it is true, due to ignorance; but in these days of enlightenment and education, ignorance on matters of vital importance is inexcusable. But in these days also of patent foods for infants, ignorance shelters itself behind assumed knowledge, and patent foods plus ignorance are the fruitful source of much rickets.

A story will illustrate my meaning. Some time ago I was interested in a "bonnie baby," the only and posthumous child of a young widowed mother. The child was the joy of her heart, and its evident health and ceaseless activity and gaiety were sources of pride and pleasure to her. She suckled the baby herself. When it was about six months old I lost sight of it for eight months. When I saw the child again I was immediately struck by its altered appearance. It was pale and peaky, had lost its gaiety and activity, and had a look of premature age and weariness. "Your baby is starved," I said with brutal frankness to the mother; "what are you feeding it on?" "I suckled it until it was eleven months old," she replied, "and since then I have fed it on ——," mentioning a patent

food. "What is it made of?" I asked. "I don't know," was the answer. "Don't know!" I exclaimed, "don't know on what you are feeding your baby! You have only one thing to do—to bring up that baby—and you are steadily starving it into rickets by not taking the trouble to learn how to feed it properly." I presented the alarmed mother with various text-books, giving the required information how to feed infants, and I hope she has profited by them; otherwise her child will have rickets. This is an example of how the disease is produced by carelessness and ignorance on the part of well-meaning mothers.

Rickets is caused by the necessary elements of albumen and fat being absent from the food, and by feeding children on starchy foods and skimmed milk. It hardly ever occurs in suckled infants; but it is developed in babies brought up by hand, or during or after weaning. Insanitary conditions, such as bad air and unwholesome dwellings, may aid in the development of rickets, but they are not sufficient to produce it; while food deficient in albumen and fat will cause it, even when the hygienic conditions are of the very best.

Infants' natural food.—I must stop for a moment to consider the proper and natural food for infants. This is, of course, mother's milk; but if not obtainable either from the child's own parent or a foster mother, then cow's or goat's milk, treated so as to resemble human milk, should be substituted. Milk is a typical food, inasmuch as it contains all the elements necessary for nutrition, namely, albumen or nitrogenous matter, fat, a carbo-hydrate in the form of sugar of milk, salts, and water. The albumen is chiefly in the form of casein, which can be precipitated or thrown down from the milk by an acid or rennet. It is thus that cheese is made from milk. The fat is suspended in the milk as minute globules, which can be clearly seen under the microscope. These globules of fat, being light, rise in the form of cream when milk is left standing for some time. Thus skimmed milk is milk deprived of its

fat, though as its albumen remains it is still a highly nutritious food for adults, but is inadmissible for infants. The sugar in milk is called lactose. Unlike ordinary sugar it cannot cause alcoholic fermentation. The mineral salts, though small in amount, are of great value from a dietetic point of view.

To know how to feed an infant properly when human milk is not available, it is necessary to know the nutritive value of other kinds of food, and to ascertain if they contain, in the proper proportions, the four necessary elements, namely, albumen, fats, carbo-hydrates, and mineral salts.

The following table gives the comparative analysis of the various kinds of milk :—

Elements.	Human Milk.	Cow's Milk.	Ass's Milk.	Goat's Milk.	Artificial Human Milk.
Nitrogenous or albuminous elements,	2·35	4·374	1·7	4·5	2·57
Hydrocarbon fat,	2·41	3·499	1·4	4·1	4·46
Carbo-hydrate or sugar of milk,	6·39	4·403	6·4	5·8	5·02
Mineral salts,	·34	·702	—	—	·57
Water,	88·51	87·132	90·5	85·6	87·38
Total,	100·0	100·0	100·0	100·0	100·0

From this we see that cow's milk is richer in nitrogenous elements and fat than human milk, so that to make it suitable for infants it must be properly diluted; goat's milk is also richer, but ass's milk is much poorer than human milk. Now compare these perfect foods with the materials frequently given to hand-fed infants, and which are productive of rickets. To do so the following table should be studied :—

Food.	Albumen.	Fat.	Starch.	Sugar.	Salts.	Water.
Arrowroot,	—	—	82·0	—	—	18
Bread,	8·1	1·6	47·4	3·6	2·3	37
Wheat flour,	10·8	2·0	6·3	4·2	1·7	15
Oatmeal,	12·6	5·6	58·4	5·4	3·0	15
Biscuit,	15·6	1·3	73·4		1·7	8
Cornflour,	11·1	8·1	65·1		1·7	14

It will be apparent on comparing this table with the previous one giving the various milk analyses, that the farinaceous foods which are given to children and frequently to hand-fed infants, are deficient in fat and contain a superabundance of starch. This deficiency may be made good by the addition of milk, or still better, of cream to the bread, flour, or biscuit used. Obvious as may appear the teachings of nature, it is a fact that some mothers, finding cow's milk disagree with their infants, and not knowing how it should be diluted and treated to make it digestible, will proceed to feed them on biscuits soaked in water, arrowroot, bread and skimmed milk, or on patent foods mixed with water, with the inevitable result of producing rickets. The fat and the albumen necessary for nutrition are withheld, and the child is fed, or rather starved, on starch. Now starch, it will be observed, has no place in milk, and it forms, moreover, no element in the proper dietary of an infant, inasmuch as infants in the early stage of existence have no power of digesting or assimilating starch. Dr. Cheadle, in his admirable book on the *Artificial Feeding of Infants*, gives an instructive case of the production of rickets by deficient food, in children of ignorant, though well-to-do parents. The parents were prosperous tradespeople, but the mother was too much occupied with business to suckle or attend to her children. Of five born healthy three had died in infancy. The child Dr. Cheadle was called to see was eleven months old, and had all the signs of well-marked rickets. The symptom which had, however, alarmed the parents was spasm of the glottis, so severe as to threaten suffocation. On inquiry it was found that all the children had been hand-fed on a patent farinaceous food, cornflour, and arrowroot made without milk, cow's milk having disagreed with them. Thus these little ones were starved to death, though abundantly fed. A proper dietary effected a cure in the case of the infant yet alive.

Symptoms of rickets.—The earliest and least distinctive symptoms of rickets are restlessness and slight feverishness

at night ; the child sweats profusely, and continually throws off its bed-clothes. Next is noticed an unwillingness on the part of the child to be touched or moved ; it seems sore all over, and has no longer any pleasure in being tossed about and caressed. The first positive evidence of rickets is given, however, by enlargement of the bones of the wrist and subsequently of the ankle, knee, and elbow joints. Then the long bones become bent and bowed, the ribs fall in laterally, their ends form knob-like projections, and the sternum projects in front, causing the well-known pigeon breast ; the bones of the head are thickened, and the fontanelles remain open long after the time they are closed in healthy children ; the head becomes large, flat on the top, with projecting forehead ; the teeth are late in appearing. While these deformities in the bony skeleton are taking place, the general condition grows worse, fever increases, perspirations are more profuse, and the tenderness of the body becomes so great that the child dreads being touched. Appetite fails, weakness increases, the child emaciates, and has a wan, anxious, pallid look. The abdomen protrudes, and the liver and spleen are often found to be hypertrophied. When rickets prove fatal, death is caused either by lung trouble induced by the falling in of the thoracic walls, or by impaired digestion and consequent weakness, or by croup or convulsions.

Rickets may exist in a much less marked degree ; the ends of the long bones may be thickened, but the constitutional symptoms may not be so marked. Recovery is the rule ; and persons who have suffered from rickets in their youth may become very strong, but they are usually short, and the deformities of the bones, the bow legs, the curved spine, and the narrow chest generally remain, and often cause much misery and discomfort in after life.

If the bones be examined in rickets, it is found that in the cartilaginous extremities, where growth is most active, there is considerable enlargement, softening, and rarefaction, and that the earthy matter present is much less than

in the bones of healthy children. It was hence formerly argued from this fact that rickets was caused by the want of lime salts, and that to give a child lime water and phosphate of lime would cure the rickets. This is, however, quite insufficient; moreover, many of the farinaceous foods on which rickety children are fed are rich in lime and phosphoric acid. Inasmuch as the disease of rickets is caused by food deficient in fat and albumen, so the cure of rickets lies in restoring these elements to the diet of the child.

Dietetic treatment.—Dr. Cheadle considers that too much reliance is placed on cod-liver oil, chemical food, lime, and iron. Drugs are not so useful as proper diet. Cream can take the place of cod-liver oil, milk of chemical food, and albuminous foods of iron. The diet of a rickety child should be most carefully examined; and when it is found, as it usually is, that the child is being fed too exclusively on a farinaceous food, the missing elements of fat and albumen must be restored. This is best done by means of cream and cod-liver oil. If cream cannot be taken, boiled cow's milk, milk puddings of entire wheat, and raw meat pulp (the making of which was described in the chapter on invalid foods) may be given. Syrup of lacto-phosphate of lime is useful; but the best of all medicines are fresh air, sunlight, and outdoor life. Parents should be on their guard with respect to many of the condensed milks advertised as good and reliable foods for infants. As has been recently pointed out in the *British Medical Journal*, some of the advertised condensed milks are made of separated milk, deprived of 90 per cent. of their fats, and are even worse foods for infants than skimmed milk. To bring up an infant on condensed separated milk is to ensure its having rickets. Those who have the care of children will be glad to know that the Milkmaid Brand of Anglo-Swiss condensed milk is reliable, and is made of whole milk. Mothers must be not only wise but wary if they would have healthy and happy children.

CHAPTER XXXI.

SCROFULA AND SCURVY.

Scrofula.

This is a disease which is supposed to be hereditary and is stated by some to be allied to consumption. A scrofulous child does not, however, often become consumptive. The signs of the disease are well known. The child is thin, pale, and unwholesome-looking, it has not the gaiety of childhood, and the glands, especially those of the neck, become hardened and swollen, and often slowly suppurate and discharge a purulent cheesy substance. The edges of these abscesses are ragged, and, when healing takes place, depressed puckered cicatrices are formed. These are unsightly, and are characteristic of a scrofulous diathesis. Malodorous discharges from the ears or nose are not infrequent in scrofula.

The treatment is simply nourishing food and fresh air, Care should first be taken to ascertain what the child can digest well, and all indigestible food should be avoided. "An abundant supply of good milk should be the basis of its diet; also wholemeal bread and plenty of butter" (Yeo). Fatty foods are what seem to be needed in scrofula; and as puddings are, as a rule, better liked by children than meat, there is little difficulty in getting them to eat food so agreeable to them. A plentiful supply of butter and cream with breakfast and tea, bread and dripping, suet pudding with jam and treacle, apple and suet pudding are all good foods for the scrofulous. Cod-liver oil is the doctor's sheet-anchor; but where this is not well borne, or there is a dislike to it, cream may take its place. To

make this digestible it is only necessary to add a teaspoonful of cherry brandy to a wineglassful of cream. Cream and soda water will be found an excellent drink for the scrofulous. The clothing should be of wool, and every opportunity taken to give the child a healthy active life in the sunshine or by the seaside. The dreaded disease may thus be warded off or ameliorated, and the weak and scrofulous child grow into a healthy adult.

Scurvy.

Allied to rickets and resembling it in many of its characteristics is the once dreaded disease of scurvy. Scurvy is still occasionally seen in hospitals, especially among children. It was once the scourge of the navy, when sailors were fed for long periods exclusively on salt meat and biscuits. It was, however, discovered that this painful disease was cured by the return of its victims to an ordinary mixed diet, and more particularly to the use of fresh vegetables and potatoes. Hence it was argued that scurvy was caused by the lack of the salts and acids contained in vegetables, fruits and potatoes. Strange to say it is not, however, sufficient in order to prevent scurvy to give the salts and acids contained in vegetables, though in cases when it is impossible, owing to their bulk, to carry even compressed vegetables, lime or lemon juice served daily as a ration to sailors will commonly prevent the disease. It has, in fact, by this means been banished from our navy.

There are some persons who are unwilling to accept the dicta of science and experience, and who put their own uninformed belief before knowledge. The breakdown of the Nares expedition to the North Pole is an example in point, and gave another pitiable illustration, if any were needed, of the cause of scurvy. Commander Nares would not follow the advice of the doctor, who urged that it was necessary for the sleighing parties, bound on long journeys across the ice, to take lime juice with them. He considered that dependence on lime juice was a doctor's fad, and held

the view that scurvy was caused by darkness, depression, etc., and believed that alcohol would be more useful to the men than lime juice. The party consequently completely broke down with scurvy. The pitiful story is thus told in the pages of the *British Medical Journal*, December, 1876 :—

"The suffering of the men on these expeditions across the ice was frightful ; without exaggeration, says one of the authors of the log-journals, 'they may have been said to have suffered agonies'. Before they were out a week or a fortnight, they were ravaged by scurvy ; their limbs swelled ; their teeth fell loose ; the blood was effused in patches ; one half of them became prostrate, fetid, miserable beings, whose existence was intolerable to themselves and those around them. Every sledge party without an exception broke down prematurely from scurvy : not only so but the disease seems to have taken all the commanders of the sledge parties by surprise ; each in turn expresses his astonishment, horror and terror of this affliction, when, its full force being felt, he can no longer shut his eyes to its nature, and each bewails pathetically his want of lime juice. 'Oh, that I had a ton of it!' writes Lieutenant Rawson, and Commander Markham groans over his pitiful modicum of two small bottles for each sledge ; does not venture to begin to use it, until, defeated by the prostration of his party, from the fearful ravages of scurvy he has resolved to turn back ; and then finds it necessary to issue only a small quantity to the sick alone, every other day, and even this expedient exhausts his store in about ten days.

"Some of the parties utterly, rapidly and completely broke down with scurvy. All were baffled and beaten by it, and all suffered fearfully from its horrible infliction. Since the days of our earlier navigators no such sad story has come home as that of the disablement and breakdown from sickness of this splendidly manned and lavishly found expedition."

They left the spirit casks behind them on the ice-fields, having learnt by bitter experience another well-known dietetic lesson,—that in cold and fatigue alcohol is worse than useless; but that under these conditions hot tea or coffee is the best restorative.

Symptoms of scurvy.—The disease begins gradually. The person who is stricken with scurvy first suffers from a feeling of increasing weakness and constant fatigue, and a sense of soreness in all the limbs. He becomes deeply despondent, and is subject to fits of faintness. Presently the characteristic signs of the disease make their appearance; the gums become swollen, turgid, dark and spongy, swelling up often over the teeth, and sometimes dropping off in gangrenous masses. The teeth are very tender, and often drop out. The breath is particularly foul. Purple patches and bruises appear on the legs; the feet swell, and there is great pain and stiffness in movement. There is often want of appetite; but even if the patient feels inclined for food, his teeth are too tender to chew with. A more miserable wretch cannot be conceived than the victim of scurvy; but his cure is certain and rapid if he can only obtain the food for which his blood is calling, namely, vegetables.

Dietetic treatment.—It is highly satisfactory when one has to treat such a painful and pitiful disease as scurvy, to know that recovery is usually assured by the simple act of changing the diet, and putting the patient on plenty of fresh, soft, succulent vegetables, and from four to eight ounces of lime or lemon juice daily. Potatoes and cabbages are the best vegetables. Yams, onions, carrots, turnips, oranges, pears, and apples are also valuable. In extreme weakness, beef-tea and milk must be given in considerable quantities until the patient is able to take solid food. When he is able to chew, meat should be given. Under this dietary the symptoms rapidly improve; the swelling and bleeding of the gums disappear, the teeth become firmer and less tender, the purple patches grow

paler and less painful, the tendency to faintness decreases, and the patient gains strength.

Scurvy can be prevented on long sea journeys, by each person eating daily at least eight ounces of preserved potatoes, three ounces of other preserved vegetables—carrots, onions, turnips, celery, mint and pickles, and drinking three ounces of lime juice. Among recommendations issued by the Board of Trade to shipowners is the following. Each man should have at least two ounces of lime or lemon juice twice a week, to be increased to an ounce daily, if any symptoms of scurvy manifest themselves. By following these simple dietetic instructions scurvy has been banished from our ships; and when it occurs, as in the Nares Polar expedition, it is due to direct neglect of obvious and well-known precautions.

Scurvy in Children.—Helpless babes need not have scurvy if their mothers knew how to feed them properly; but owing to the absence of anti-scorbutic elements in their foods, children sometimes suffer from this disease in a severe and well-marked form. The cachexia, mental apathy, and depression, the muscular weakness, the purple spots and patches with deep extravasations of blood, the tenderness of the limbs and the swollen ankles are present, with the most characteristic symptom of all, the soft, livid, purple and spongy condition of the gums, which are sometimes so swollen as to hide the teeth altogether and to protrude from the lips in lobulated, bleeding and ulcerated masses. Unless these symptoms be relieved death occurs from syncope, or from increasing weakness. Dr. Cheadle gives among others a case typical of the cause and treatment of scurvy in an infant. A healthy child, whose parents were in good circumstances, was suckled till it was six months old; it was then weaned, and fed entirely on oatmeal and rusks mixed with water only; no milk was given to the child, condensed milk, which had been previously tried, being thought to disagree. At ten months mutton broth was added. This diet was continued without change till the

sixteenth month. It will be remarked that it was deficient in animal fat, and contained little nitrogenous material. It was a diet likely to develop both rickets and scurvy. Most children of a year old are given milk and potatoes. In spite of the administration of potatoes and cod-liver oil, well-marked scurvy developed in this case. The treatment consisted in giving pure milk, fine potato gruel, and raw meat. In a few months the child was running about strong and well. Numerous other cases may be quoted, but there is a wearisome similitude in all of them. The little patients are nearly always bottle-fed children under two years old. "In no instance," says Dr. Cheadle, "have I seen the disease arise in an infant at the breast, or when fed on an ample supply of good cow's milk. Oatmeal and water, bread and water, various patent farinaceous and desiccated foods, peptonised condensed milk, sterilised milk, pancreatised food and milk, German sausages, bread and butter and tea, beef-tea, gravy and bread, in some cases with no fresh milk at all, in a few with a very small amount only, are the dietaries on which I have seen scurvy develop. And in these cases, with children as with adults, the improvement which immediately follows the administration of anti-scorbutics is one of the most remarkable facts in the whole range of medicine, and a convincing proof of the condition being true scurvy."

CHAPTER XXXII.

FEVER.

The rise of the body temperature is the pathognomonic sign of fever. It is not, however, the only symptom which constitutes it. The well-known pathological condition known as fever is manifested by a group of symptoms, one or more of which may be more or less marked or may be even entirely absent. The rise of temperature is generally preceded by chill or rigor. The person has the sensation of general chilliness; he shivers, and feels as if cold water were running down his back; the skin has the appearance of goose skin, and is often bluish in colour; the face looks pinched, the eyeballs are sunken, respiration is more frequent and the pulse quickened. The patient feels nauseated, depressed, miserable in mind and body, and attempts to obtain warmth by curling himself up into warm bedding or clothes. Rise of temperature follows, and is accompanied in typical cases with restlessness of the body and limbs, headache, dulness and mental apathy, extreme sensibility to light and noise, a feeling of great fatigue, rapidly increasing muscular weakness, drowsiness or sleeplessness, with illusions, hallucinations and delirium, wasting both of the muscles and of the fat of the body, an arrest of the digestive functions, and an inability to digest solid food, great thirst, dry mouth, dirty tongue, a dry burning skin, scanty excretion of urine, and often constipation.

This collection of symptoms shows a profound disturbance of all the organs of the body. Whether the increased heat is the cause of these symptoms and organic disturbances, or whether the increased temperature is one of the

effects of a specific poison acting on the sympathetic nervous system, are points which are still undecided by pathologists. The question of importance to us, in considering the treatment of fever from the dietetic point of view, is not theoretical, but how, practically, to prevent by proper diet the extravagant tissue waste which is going on during the fever process, and so to maintain and build up the strength of the patient, that when the fever has passed, convalescence may proceed uninterruptedly towards recovery.

The waste of albumen.—To this end there are certain well-ascertained facts to guide us. In normal health the intake of albumen in the food is balanced by the re-constitution of the albuminous tissues and fluids in the body, and by the excretion of urea. In fever this balance is disturbed, owing probably to the high temperature. The combustion of albumen is far greater than in health, and the excretion of urea about double. At the same time appetite is abolished, and stomachal digestion is suspended. Not only is there a great distaste for solid food, but it is rejected by the stomach if taken ; hence the ordinary supply of albumen is cut off. How, then, is the quantity of albumen obtained for the high rate of combustion which takes place in the body during fever? First, by the combustion of the organ-albumen, that is, of the albumen contained in the muscles and the blood corpuscles, and secondly, by the combustion of the store-albumen, which is contained in the tissues as a reserve. From the abnormal destruction of albumen which takes place in fever, it is easily understood why muscular weakness is so rapid and extreme after even a short attack of fever, and how, owing to the destruction of the muscles and blood corpuscles, the patient grows pale, anæmic, and weak.

Excretion of urea.—The excretion of urea in fever is out of all proportion to the amount of albuminous food taken, and is due to the large decomposition of the organ-albumen and store-albumen in the body during the fever process.

The waste of potash salts.—During fever the excretion of potash by the urine is excessive. This is probably due to the destruction of the muscles and blood corpuscles, both of which contain potassium.

Diet indications.—If attention has been given to the foregoing explanation, which has been rendered as clear and simple as the difficulties of the subject allow, it is evident that the aim of dietetic treatment in fever must be to prevent the excessive waste of the albumen of the tissues, and to supply the body with albumen and salts, which are being rapidly burnt up in the system, so that when the fever passes, emaciation and weakness may not be so extreme as to greatly retard convalescence.

Beef-teas.—The almost universal custom is to feed the patient on beef-tea. This treatment is from time to time attacked on the ground that beef-tea is neither a strengthening nor an albuminous food, but is mainly stimulating, and contains only gelatine and not albumen. This is true, but beef-tea still remains a very valuable food in fever. It is a preservative food ; it preserves the tissues from destruction, and thus indirectly maintains strength. The muscles and blood corpuscles are being destroyed in the fever process. If therefore a nitrogenous food can be presented for combustion in their place, they are saved. Such a food is beef-tea, containing, as it does, a large amount of soluble gelatine. Beef-tea also contains salts and extractives of the greatest use to the patient ; and if, as I have elsewhere advised, a little muslin bag full of chopped vegetables be stewed in the beef-tea and the juices be squeezed into the liquid before serving, vegetable salts, which are necessary to the depleted system, will be added.

Peptonised beef-teas can be used with advantage, and in prolonged cases *meat pulp* may be given mixed with broth or beef-tea. Of the prepared extracts Armour's nutrient wine of *beef peptone* is one which should be of the greatest value in fever. Each pint contains one pound of predigested beef. Here, therefore, peptones, not gelatine,

are the nitrogenous food administered. This excellent preparation can be obtained, I believe, in a non-alcoholic form.

Dr. Burney Yeo says, "The unpleasant taste and smell of peptonised foods are opposed to their general adoption". There is no reason, however, why these foods should have an unpleasant taste and smell if carefully made. Celery seed should be boiled with the beef-tea; or a *roux*, made with a very small quantity of fried onions or baked flour, be added to the cup of beef-tea, or a flavouring may be given by vegetables or herbs. These flavours may be varied from day to day, and peptonised foods be thus made palatable and pleasant.

Test for peptones.—It may be interesting and useful to the scientific nurse to know how to test a beef-tea or beef-extract for peptones. Dilute the beef-tea with five or six times its volume of water, render the mixture alkaline with caustic potash, and add a small quantity of sulphate of copper. If peptones are present a brilliant rose-red colour is produced, if the proteids are unchanged a violet tint appears.

Farinaceous foods.—Duodenal digestion is not so profoundly altered in fever as stomachal digestion, and hence farinaceous foods are more easily digested. Gruel and arrowroot are most useful articles of diet in the sick-room, and as they are generally the vehicle for milk they are excellent foods. The use of milk must, however, be carefully watched, not only to see if it agrees with the patient, but to ascertain if it passes through the digestive track as hard and irritating curds. In this case its use must be discontinued. Junket is an excellent dish not sufficiently used for fever patients.

In cases where there are periods of remittance of the high temperature, as in intermittent fever, it is advisable to give the patient solid food during the periods of intermission, if it does not provoke vomiting and diarrhœa.

During convalescence the return to solid food must be gradual; to overfeed a convalescent is as unwise as to starve

a fever patient. The food must be selected especially with the object of repairing tissue waste. It should therefore be albuminous, and of a kind and variety not to overtax the weakened digestive power. The ball of a grilled mutton chop, braised fillet of beef, roast and boiled chicken are among the best and most digestible foods for the convalescent from acute fever.

CHAPTER XXXIII.

TYPHOID FEVER.

Typhoid fever is caused by the presence in the intestines of a minute bacillus, which is most commonly introduced into the body by the means of polluted water or milk, or, as some suppose, by aerial transport in sewer gas, etc. It finds its proper soil or nidus for vigorous life and multiplication in the solitary glands and in Peyer's patches of the small intestine, as well as in the mesenteric glands. The solitary glands of the small intestine are about the size of a millet seed, and are found scattered over every part of the mucous membrane of the ileum. They are simple in structure, being composed merely of dense net-like tissue, the meshes of which are closely packed with lymph corpuscles. They are pervaded by fine capillaries and surrounded by a rich plexus of lymphatic vessels. The nodules bulge towards the interior of the gut, and their bases are situated in the submucous tissue. Their upper surfaces are free from villi. Peyer's patches are simply collections of solitary glands. They are oblong in shape, and are about an inch in width and from half an inch to two or even four inches in length; they are found placed lengthways opposite the side of the intestine which is attached to the mesentery.

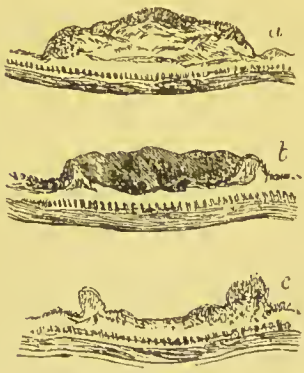


FIG. 12.—DIAGRAMMATIC REPRESENTATION OF PEYER'S PATCHES IN TYPHOID FEVER.

a. Early stage with swelling of the patch; *b*. Later stage with sloughing; *c*. Ulcer with infiltrated walls (from Thierfelden).

The morbid changes in the intestine.—When a person is infected with typhoid by swallowing the bacilli typhi in the water or food, the microbes make their way to the Peyer's patches and solitary glands, where they find their proper soil. They here multiply, and by their irritating presence, as well as by the poisonous substance which they excrete in the process of living, inflammation of the closed follicles is set up. The glands swell and become solid, ulceration follows, and a slough is finally separated and thrown off. The walls of the glands are succulent and vascular, and considerable hæmorrhage may be caused by sloughing. The ulceration may, moreover, extend downwards through the muscular coat, even into the serous coat, and result in perforation of the intestine. If the process is gradual, the inflammation generally extends to the peritoneum; fibrinous exudations are then thrown out, and adhesions take place between the peritoneum and the thinned walls of the intestine. These inflammatory adhesions form a false wall to the intestine and prevent the escape of its contents into the abdominal cavity. The ulceration may be so severe and rapid as to cut off the blood supply of the serous coat, in which case the latter undergoes necrosis, perforation takes place, the contents of the intestine pass into the peritoneal cavity, and fatal peritonitis ensues.

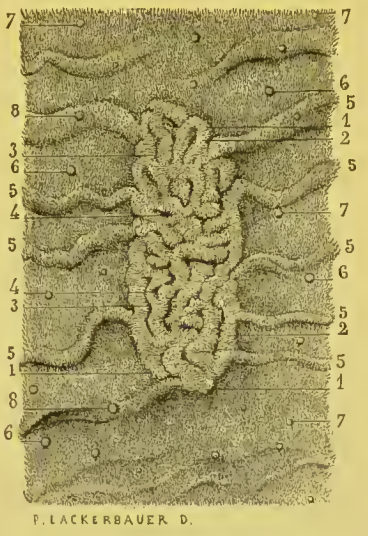


FIG. 13.—A PEYER'S PATCH SEEN FROM ITS FREE OR SUPERFICIAL SIDE.

1, 1, 1. A folded Peyer's Patch. 2, 2. The folds which form the superficial or mucous layer of this patch. 3, 3. The grooves which separate the folds. 4, 4. Pits observed from place to place in these folds. 5, 5, 5. Valvulæ conniventes. 6, 6. Solitary closed follicles situated in the space between the valvulæ. 7, 7, 7. Other follicles similar to the preceding but smaller. 8, 8. Closed follicles situated on the summit of the valvulæ conniventes.

Periods of the illness corresponding to morbid processes.

—Inflammation of the follicles is contemporaneous with the first symptoms of illness. It reaches its culminating point about the tenth day. If the case is slight, resolution or absorption of the products of inflammation then takes place slowly; in severe cases the follicles ulcerate. The sloughs separate during the third week of the illness, but the process may not be completed until the fourth week. Cicatrisation of the raw surfaces of Peyer's patches begins about the end of the third week, and takes about two weeks to complete. Indiscretions of diet may, however, again set up inflammation, and Dr. Bristowe declares that the liability to perforation continues for from two to three months after the commencement of the illness.

Physiological rest the rational treatment.—Knowledge of the processes of inflammation going on in the intestines of a typhoid patient gives the indication for treatment. This is in a word physiological rest. Let the bowel remain as immobile as possible, so that cicatrisation of the raw, ulcerated, and bleeding patches inside it may take place, and let no impetus be given towards perforation by undigested particles of food setting up violent peristaltic action. The rest must be also muscular as well as physiological. A sudden movement of the patient may rupture the friable adhesions between the ulcerated intestine and the peritoneum, and the dreaded perforation into the peritoneal cavity may consequently take place. When the inflammatory process, accompanied by fever, is over, and the appetite returns after the third week, the condition of physiological rest of the intestine must still be maintained as a leading principle of the diet. The slough is probably thrown off, but the raw surface is not yet cicatrised, and until cicatrisation is complete the patient is not safe from the fatal accident of perforation. In feeding him this is the first consideration.

Typhoid patients sometimes killed by their friends' kindness.—Every hospital student can recall cases in which a promising typhoid case, recovering from an acute attack,

has suffered a sudden relapse, with, perhaps, perforation and death. On inquiry it is often found that the bad symptoms set in after "visiting day," and that kind friends (sympathising with the patient's desire for solid food and his distaste for the rigid *régime* so long enforced) have surreptitiously brought him plum-cake, fruit, or bread and jam, etc.; these have been secretly eaten at the cost of a relapse, and perhaps even of life. It is only necessary to study the pathological conditions depicted in Fig. 12, and to appreciate the fact that the intestine is in typhoid ulcerated and raw, and its walls dangerously thinned at certain points, in order to recognise the importance of not giving the patient solid food or articles likely to set up irritation or to cause violent peristaltic action of the intestine.

The cardinal principles of dietetic treatment are as follows: (1) to maintain the strength of the patient; (2) to give the intestine the physiological rest necessary, in order to avoid the accident of perforation, and to favour repair and cicatrisation. In all acute fevers metabolism of the tissues is abnormally active, and the waste great. The products of combustion are consequently present in abundance in the blood. Appetite is abolished, and stomachal digestion is suspended. Our object must, therefore, be to give the patient foods (1) that are easily digested, or rather, quickly absorbed; (2) that will not increase the amount of urates in the blood; (3) that will diminish the abnormal waste of the tissues. Hence the reason for the use in acute fevers, of beef-teas, jellies, arrowroot, gruel, and milk. In typhoid it must, moreover, always be borne in mind that the food given should be in the form of bland fluids very easily digested.

Milk.—This is the aliment that suggests itself as the most appropriate for typhoid patients. It is a complete food, and on it alone a patient can subsist for an indefinite time. As a rule it is well borne. In such cases it should be taken in small quantities at frequent intervals. It must, however, be borne in mind that though milk is a fluid out

of the body, it is curdled at once in the stomach by the action of the gastric acid. It may therefore, if not digested, pass as a firm solid through the whole length of the intestine, and set up irritation, leading to injury. It is of the utmost importance that in typhoid the evacuations of the patient should be carefully watched. If the milk is excreted in the form of curds, this is an indication that the patient cannot digest pure milk. It must then be given diluted. Equal parts of milk and Vichy or Vals water, or one part of milk to two of Apollinaris or soda water, may be administered, or ten grains of bicarbonate of soda and the same quantity of common salt should be added to every pint of milk and water in equal parts. Milk thus diluted and mixed with alkali can often be absorbed when pure undiluted milk would be undigested (Yeo).

Ass's milk, which is precipitated in the stomach in an extremely fine curd, and which is consequently the more easily digested, may be substituted for cow's milk.

Whey may be usefully given where milk is ill digested. It is made by boiling a pint of milk with a teaspoonful or two of lemon juice or rennet, straining through muslin, and squeezing all the fluid from the curd. Care should be taken to break up the curd with the fingers while pressing, for then much of the fat and some of the finely divided casein of the milk will pass into the whey and make it more nutritious.

Eggs.—These should not be cooked, but the yolks beaten up raw with boiling water or hot broth.

Beef-tea.—The usefulness of beef-tea is universally acknowledged in acute fevers. It is valuable in many different ways, inasmuch as it contains gelatine, which, as already described, prevents waste of the albuminous tissues; soluble salts, which compensate for the extravagant loss of these in fever; and certain stimulating substances dissolved out from the beef. Mutton and chicken broths and clear soups are useful, as well as beef-tea

essence, which should not, however, be given in too concentrated a form. In preparing clear soups and broths, vegetable juices should be added in order to supply the body with the salts and acids contained in vegetables, which are particularly needed in fever. It is important, however, to exclude the indigestible vegetable fibres from the soup. The vegetables used should, together with the aromatic herbs, be cut up fine and placed in a muslin bag and boiled. The juices should then be pressed into the soup or broth.

Raw meat pulp may be given in prolonged cases of typhoid. Thin oatmeal or barley gruel, carefully strained from all gritty and irritating particles, and flavoured with sugar and lemon peel, is one of the best of the farinaceous foods. It can also be mixed with milk, beef-tea, or meat essences, and thus a useful composite food is produced.

Water is an absolute necessity of the fever patient to allay his consuming thirst. Barley water, toast water, pure iced water, soda and effervescing waters can be given, changing one for another as the patient tires of each.

Alcohol in any form is as a rule forbidden, and should only be given under medical advice.

Diet during convalescence.—This is often extremely difficult to arrange. As soon as the temperature falls to normal, the appetite of the patient often becomes voracious. His piteous demands for food are almost irresistible; but they must, notwithstanding, be firmly resisted, for it must be remembered that the intestine is still undergoing the process of ulceration and repair, and that solid food might set up fresh inflammation and cause fatal peritonitis. It is not safe to give any solid food till the temperature has been normal for at least eight days, and in severe cases for a longer period. The return to solid food should be very gradual. The beef-tea or soup can first be taken with fine bread crumb; custards and jellies may then be added; eggs are admissible lightly poached or beaten up in broth, also oysters and boiled fish; sandwiches made of pounded

chicken between thin squares of bread may next be attempted, and if no bad consequences result a slice from the breast of a boiled chicken may be eaten ; but not until all danger is completely past may the patient enjoy again his mutton chop and rump steak.

Dietetic precautions in preventing typhoid.—It must never be forgotten that typhoid fever is a filth disease, and that its most frequent cause is the pollution of drinking water by infiltration from drains or cesspools containing the specific poison of typhoid. To ensure protection against typhoid it is first of all necessary to make sure of a perfectly pure drinking water ; but as this is difficult, if not impossible, under all circumstances, the drinking water should be always boiled, where there is reason to believe that the source is or may be polluted. This is a precaution which should be invariably taken in all those countries where the laws of sanitation are not observed, as in Italy, Spain, and the East. A necessary part of the traveller's luggage is a small Etna, by which he can boil in his bedroom all the water he intends to drink. Milk, of the source of which we are not sure, should always be boiled before being given to children to drink. If these simple precautions were observed the cases of typhoid fever which not infrequently occur after a visit to the Continent would often be prevented.

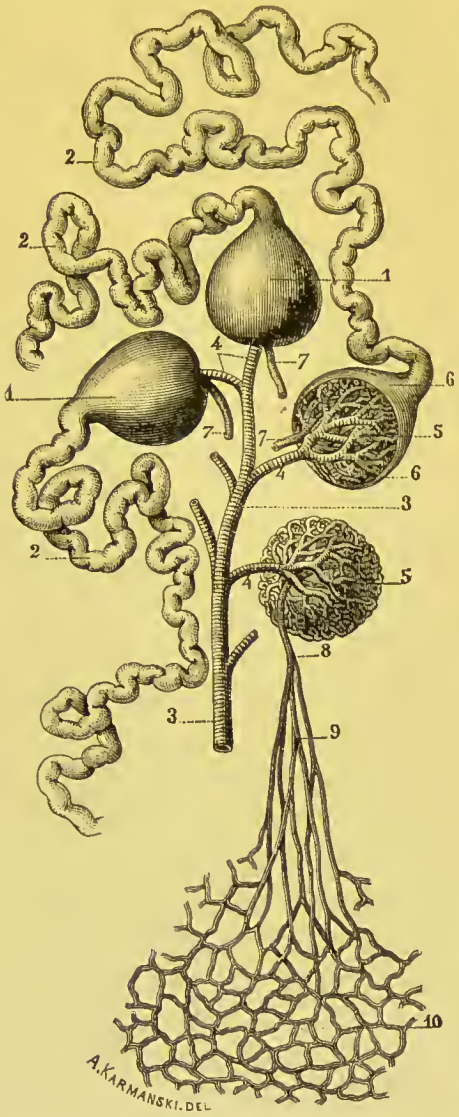
CHAPTER XXXIV.

CHRONIC BRIGHT'S DISEASE.

The pathology of Bright's disease.—If my readers will turn to the chapter in which the structure of the kidney is described, it will be found that that organ is represented as performing the part of a scavenger and a filter in the body. It will be remembered that the arterial blood is brought by the short arteries of the kidney straight from the main current into a close tangle of loops of blood vessels called a glomerulus. This glomerulus is pushed into the blind and expanded head of a long uriniferous tubule. The cells lining this bag-like end of the tubule are small and flat, and they act merely as a filter. The blood, carried with considerable force straight from the renal artery, is brought to a sudden condition of stasis in the loops of the glomerulus, and it can be easily understood how that, under these circumstances, the blood parts with a good deal of its fluid. What, however, passes from the blood is not its nutritive constituent parts, but its excess of water and the excretory products with which it is laden. These products are specially urea and urates, which are, as has been already fully explained, the final products of the digestion of albuminous foods.

Now, if instead of the blood parting only with urea and water in the kidney, it allowed the albumen, which forms its most important nutritive constituent, to pass across the filter into the uriniferous tubules, and if at the same time the excretory products of urea and urates were retained in the blood, an abnormal condition, highly prejudicial to health, would be present; for there would be an extravagant

waste of albumen, out of which the blood reconstructs the tissues and fluids of the body, and the blood instead of being cleansed in the kidney would remain charged with the poisonous products of combustion. This is what occurs in chronic Bright's disease. The kidney is damaged; it fails to separate the urea from the blood, and it allows the albumen to escape into the tubules.



The symptoms of Bright's disease. — The consequences are increasing weakness and frequently emaciation, enfeeblement of the mental powers owing to the presence of effete products in the blood, thickening of the arteriesdue to the irritative action of these products on the walls of the arteries, consequent embarrassment of the action of the heart, venous congestion, and the

FIG. 14.—GLOMERULI OF THE KIDNEY; ORIGIN OF THE URINIFEROUS TUBULES.

1, 1. Glomeruli surrounded by their capsules, or the funnel-shaped terminations of the uriniferous tubules. 2, 2, 2. Uriniferous tubules springing from the capsules and much contorted in their course. 3, 3, 3. The interlobular branch of the renal artery. 4, 4. Its branches or the afferent vessels of the glomeruli. 5, 5. Two glomeruli in which are convoluted the afferent vessels. 6, 6. Glomerulus with the capsule partly removed. 7, 7. Efferent vessels of the glomeruli. 8. Efferent vessel the branches of which, 9, break up into the capillary network of the kidney, 10.

escape of the fluid of the blood into the tissues, with the consequent symptoms of dropsy.

The aim in treatment.—There are obviously, therefore, three important considerations to be taken into account in treating chronic Bright's disease—namely, how to prevent the waste of albumen, how to make good this waste, and how to prevent poisoning by the retention of urea and effete products in the blood. Before, however, considering treatment it would be as well to inquire into the

Causes of Bright's disease.— These are acute fevers, cold, alcohol, and excessive eating of meat.

Acute albuminuria is an almost constant

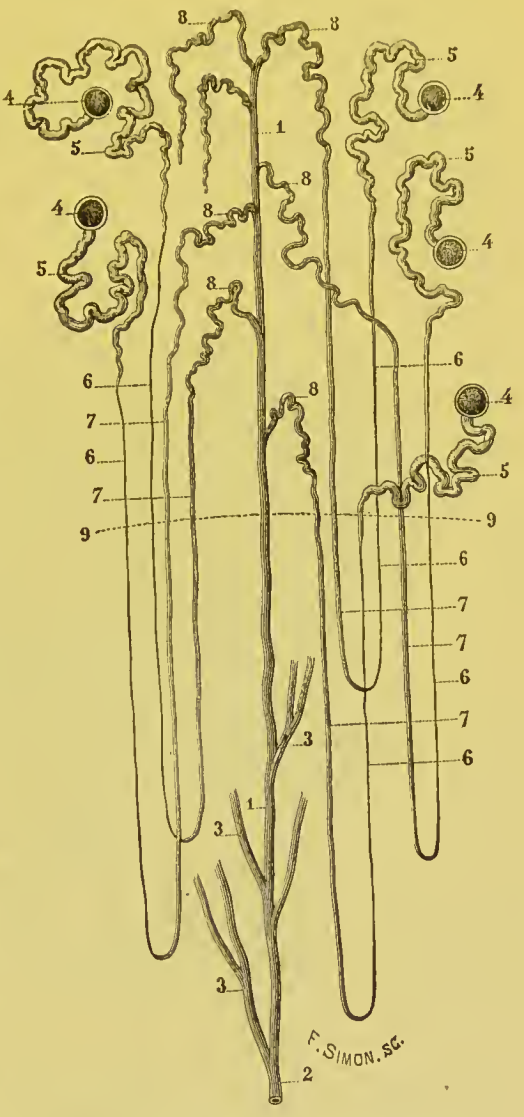


FIG. 15.—COURSE OF THE URINIFEROUS DUCTS, DIAGRAMMATIC PLAN.

1, 1. Rectilinear uriniferous tubule; a collecting duct passing from the periphery of the lobes towards the papilli of the kidney towards which it opens. 2. Lower end of the tubule, which has been cut off a little above its mouth for the convenience of the drawing. 3, 3, 3. Other collecting tubules opening into the cavity of the preceding. 4, 4, 4, 4, 4. Malpighian bodies or glomeruli. 5, 5, 5, 5, 5. Contorted tubules springing from the glomeruli and forming the greater part of the cortical substance of the kidney. 6, 6, 6, 6, 6. Straight tubes succeeding the contorted tubes and descending from the cortical into the medullary substance. 7, 7, 7, 7, 7. Larger branches forming loops. 8, 8, 8, 8, 8. Other ascending branches.

symptom in scarlet fever, and frequently also of the other eruptive fevers. In these cases recovery from the albuminuria is the rule with appropriate treatment; but sometimes the attacks leave behind a certain enfeeblement of the action of the kidney, which may finally result in the establishment of chronic Bright's disease. The progress of the disease may be so slow and insidious that it is not noticed till certain un-

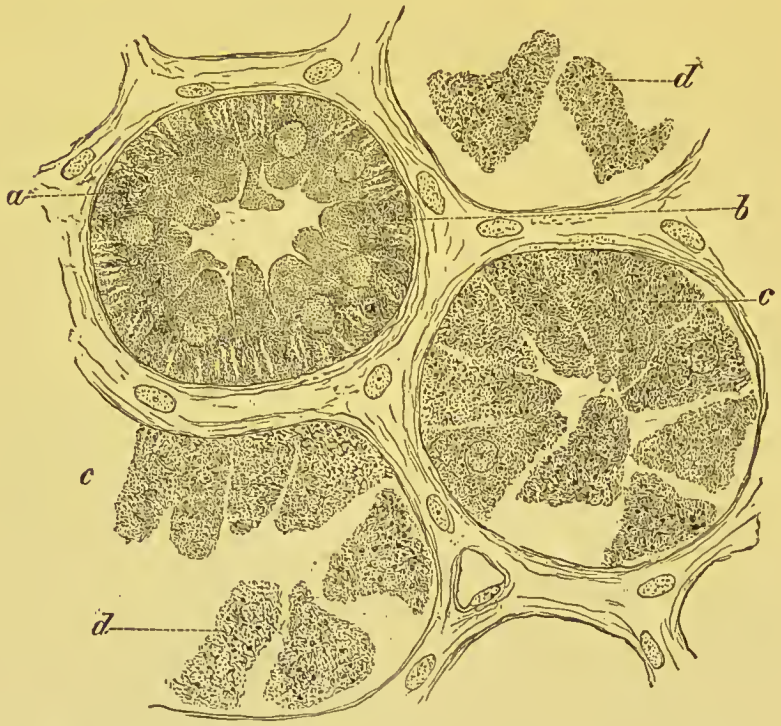


FIG. 16.—SECTION OF DISEASED KIDNEY IN BRIGHT'S DISEASE.

a. Normal epithelium. *b*. Epithelial cells cloudy and swollen. *c*. Cells in extreme degeneration. *d*. Loose degenerate epithelial cells.

explained symptoms lead to the examination of the urine, when albumen is found to be present. Cold is a frequent cause of Bright's disease, in cabmen and others whose work requires them to be exposed to all weathers. The abuse of alcohol also frequently results in chronic albuminuria. The presence of albumen in the blood seems to exercise a peculiarly irritating influence on the tissues of the kidney. To

excessive consumption of meat, and the consequent labour thrown upon the kidneys, some of the cases of Bright's disease, from which the well-to-do and well-fed suffer, are attributed. Worry and anxiety are also, there is little doubt, frequently the cause of chronic albuminuria. It may be objected to the assertion regarding meat eating as a cause, that a great variety of experiments have demonstrated that temporary albuminuria cannot be produced experimentally

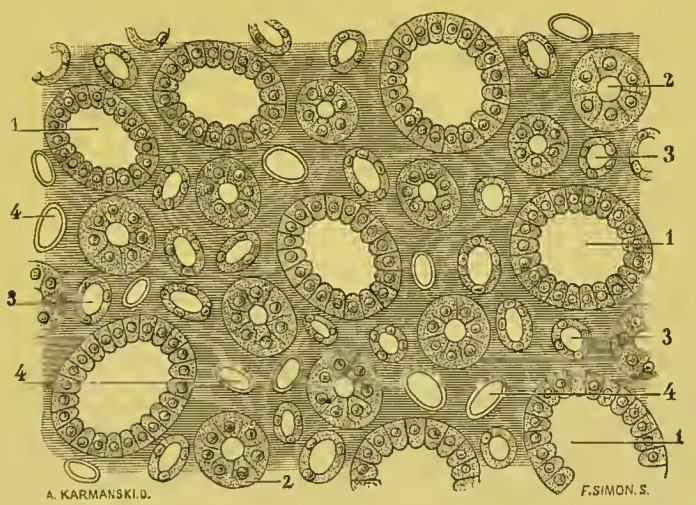


FIG. 17.—TRANSVERSE SECTION OF THE MEDULLARY SUBSTANCE OF THE HEALTHY KIDNEY, MAGNIFIED 350 DIAMETERS.

1, 1, 1. Section of the collecting tubes, showing their diameter, their cavity, and their lining epithelium. 2, 2. Ditto of the ascending portion of the uriniferous tubules. 3, 3, 3. Section of the descending branch of the same, showing their much smaller calibre, slightly larger cavity, and very flat epithelium. 4, 4, 4. Section of the blood vessels.

by an excessive albuminous diet. This may be the case, and yet the continuous use of an extravagantly albuminous diet, combined with an abuse of alcohol, may and does throw on the kidneys so great a work of elimination, that subacute congestion and consequent albuminuria may be the result. Certain it is that in meat-eating countries Bright's disease is much more prevalent than in those where the staple articles of diet are rice and fish.

Treatment by diet.—Two objects must here be aimed

at: to diminish the loss of albumen, and the production of effete excretory products. It has been erroneously thought that, because albumen is lost by the kidney, there must be an excess of albumen in the diet to compensate for this loss; but it is forgotten that while the albumen is lost by the blood the urea is retained, and that as in the digestion of albumen, urea is the final product, an excess of albumen in the food will, when the kidneys do not excrete all the urea, lead to a dangerous accumulation of poisonous products in the blood, with probably uræmic poisoning, coma, and death as the result. The indications therefore are to give such nutritious food as will maintain the strength without increasing nitrogenous refuse in the blood.

Milk diet.—It has been found that the best food in severe cases of Bright's disease is milk, and if it is well borne the happiest results have been obtained from an exclusive milk diet. It is quite remarkable how beneficial the result often is when a rigid milk diet has been maintained. The amount of urine has increased, the albumen passed has diminished, the amount of urea excreted has been augmented, the dropsy has disappeared, and the improvement in strength and the general well-being have been most marked. The milk should be taken as fresh as possible, and in small quantities at short intervals, namely, about six ounces every hour during the day, one glass on getting up and another on going to bed—about from three to four quarts a day in all. If the milk is disliked and produces a disagreeable taste in the mouth, it can be mixed with a little lime water or aerated waters, or a small amount of alkaline water can be taken after the glass of milk. If the milk treatment is tolerated by the patient, it should be continued either till there is a complete disappearance of albumen from the urine, or the amount of it is very much reduced. This period varies in different cases, but usually after six to eight weeks of milk diet, there is such a marked improvement in the condition

of the patient, and such a striking amelioration of symptoms, that he may be allowed to gradually return to a mixed diet. If there should afterwards be a return of the dropsy and albuminuria the milk diet should be again enforced.

Some patients have been known to live on milk for years, and have certainly suffered less discomfort, and have lived longer, than if they had attempted to live on an ordinary diet. On leaving off the milk diet the return to an ordinary regimen should be by cautious and slow degrees. A little arrowroot should first be mixed with the milk, then rice and tapioca, milk puddings should be added, and finally a little fish, chicken, and cooked vegetable may be ventured on. Daily examinations of the urine should be made to see what influence the change of diet has on the excretion of the albumen, and if any particular articles of diet exercise a malign influence. If the albumen does not reappear, a light nutritious dietary can then be established.

What an albuminuric may and may not take.—There are certain things which the albuminuric must avoid, and they are briefly butcher's meat and alcohol.

There is one thing, however, which an albuminuric may take in abundance, but which is often ignorantly withheld from him in the fear that it causes dropsy,—and that is water. Water is an excellent diuretic in these cases. It dissolves out from the blood effete products which are soluble, and it washes out the tubules of the kidneys which are clogged with the *débris* of broken-down cells. Water should not be taken in excessive quantities at a time, but in small quantities at frequent intervals, and between meals rather than at them. It will be found that water will diminish dropsy rather than provoke it, especially if it is alkaline and slightly purgative in action. Professor Semmola, of Naples, recommends the following drink for the daily and habitual use of patients with Bright's disease:

Sodium iodide, - - - -	15 grains.
Sodium phosphate, - - - -	30 grains.
Sodium chloride, - - - -	90 grains.
Drinking water, - - - -	36 ounces.

CHAPTER XXXV.

CHRONIC BRIGHT'S DISEASE—(*continued*).

Dishes for the Albuminuric.

Recipes for vegetable soups.—The study of the preparation of various dishes and soups which shall be at the same time nutritious and appetising and yet not too stimulating and nitrogenous, becomes the duty of the housekeeper who has to cater for the victim of Bright's disease. These patients, particularly those suffering from the contracted-kidney form of disease, have feeble and capricious appetites, weak digestions, and often suffer from constant nausea. To prepare their food so that it shall be attractive, nutritious, and yet deficient in strong meats, will tax the art of the cook. Vegetable soups, which may be varied from day to day, according to the vegetables in season, will be found to be most useful articles of diet in cases of chronic Bright's disease. I quote the following method of the preparation of these soups from Sir Henry Thompson's valuable and suggestive treatise on *Food and Feeding*.

The following is a good recipe for a clear, purely vegetable stock: "Slice two carrots, two turnips, a head of celery, and two onions; put into a frying-pan with a few sweet herbs and half a pound of butter. Fry until well browned, then put them with three or four cloves, some salt and black pepper, into six pints of cold water in a saucepan; bring to the boil, and gently simmer for two or three hours, reducing to four pints, not less; strain off into a vessel, letting it stand for use. When required, pour off

the clear liquor, leaving the deposit, and you will have a good vegetable stock. If it is to be used as a clear vegetable soup, heat, adding at the close two tablespoonfuls of cornflour previously mixed smooth in some of the liquor, and let the whole boil; if any scum arise, remove it. The cornflour gives to the decoction an agreeable body.

"To convert this into a meat *consommé*, add after boiling, and just before serving, two full teaspoonfuls of the Liebig Company's Extract of Meat.

"Another mode of giving body when a soup *maigre* is not required is to make a decoction of beef bones without meat, which have been thoroughly broken and allowed to simmer gently at least six hours, then cooled and the fat removed. The result, which is a strong jelly, can be warmed, strained clear through flannel, and used instead of water with which to make the vegetable soup as above directed; it adds substance and quality, and the animal matter takes the place of the cornflour employed for the preceding *soupe maigre*.

"Thickened vegetable soups may be made with these stocks, or with a weak meat stock, by rubbing in smooth, well-made *purées* of almost any vegetable matter. Those most commonly used are made from green peas, potato, carrot, turnip, artichoke, tomato, salsify, etc., or from dried vegetable products, as split peas, lentils, haricots, rice, arrowroot, semolina, etc."

Methods of cooking macaroni.—Macaroni is also, as the same careful observer points out, an article of diet greatly neglected by the English, and would be valuable in the cases we are considering. The methods of cooking macaroni, as recommended by Sir Henry Thompson, are, as I have found from personal experience, so excellent that I find it impossible to abridge them, and quote them in full.

"Put four ounces of good macaroni (Genoa or Naples), as little broken as possible, into a saucepan with three or four pints of boiling water. Boil ten minutes, not longer.

Then pour off all the water, and place the macaroni in a stewpan with a pint of good and well-flavoured stock made from beef or veal, or both (or from a well-furnished stock pot), adding a saltspoon of salt and half that quantity of pepper, and let it simmer at the corner of the fire until the macaroni is tender; it is never to be soft and flabby. The time necessarily varies, according to the kind and size of the macaroni, *e.g.*, fifty or sixty minutes for the best Genoese, from twenty-five to thirty minutes for Neapolitan. Its condition, however, should be tested by trying a small piece. Most of the stock is absorbed by the macaroni by this time; but that which remains, probably a fourth part of the original quantity, may be strengthened, if necessary, by the third or the half of a teaspoonful of the genuine Liebig's Extract of Meat, and thickened by adding a little baked flour (baked quite brown), which is preferable for this purpose to the brown *roux* often used, which contains butter in a somewhat indigestible form. The above constitutes macaroni *au jus* in the simplest form.

"For those who can digest cheese and butter, an ounce of grated Parmesan, and, perhaps, half an ounce of good English cheese may be added, gradually stirring well during the latter half of the process, towards the end of which a little pat of butter may be added, with a sprinkle of Parmesan over the dish when filled, before serving. The macaroni ought now to 'spin' well, that is delicate threads should extend from one portion to another when moved. Lastly, hot tomato sauce may be poured over it, or be supplied separately, since some prefer the macaroni without this addition. Serve on a hot dish provided with a cover. It is now a dish of macaroni *à l'Italienne.*

"If there is only a weak stock, chiefly made from bones, etc., in the stock pot, use it, but add rather a larger portion of the Liebig's Extract. In such a case a little flour of lentils, well boiled to thicken the stock with, would be a suitable addition. The Liebig's Extract should never be added until the end of the process, and merely be well

stirred in immediately after removing from the fire to serve.

" If, instead of stock, milk is used, an agreeable change may be made; and this form constitutes macaroni *au maigre*, the foregoing recipes being *au gras*. To prepare this, boil four ounces as before, ten minutes; drain and place in a stewpan with a pint of milk, simmering as above directed until sufficiently tender. Serve hot. Any milk remaining unabsorbed by the macaroni may be thickened with baked flour (white). Flavour with a little cinnamon or vanilla, or otherwise to taste, and sweeten with sugar or saccharin, if desired. For those who prefer a savoury dish, and can take cheese and butter, a tablespoonful of grated Parmesan and a small pat of butter should be gradually added, stirring it in during the latter part of the simmering process, according to the directions just given for macaroni *à l'Italienne*."

Foods allowed.—These recipes are illustrative of the kind of diet which should be prepared for an albuminuric. Many of the recipes which have already been given for gout and rheumatism would be also applicable. I must state, in conclusion, that the following list of dishes and articles is permissible. All kinds of farinaceous food, rice, tapioca, arrowroot, hominy, oatmeal, cornflour, gruel, etc., cooked with milk or made into puddings. All kinds of well-cooked vegetables, avoiding in serious cases, peas, beans, and lentils. Soups made of fish; *purées* of vegetables and thin bone stock; cocoa, coffee, and chocolate; cooked fruit, koumiss and junket, and fish and white meats in small quantity.

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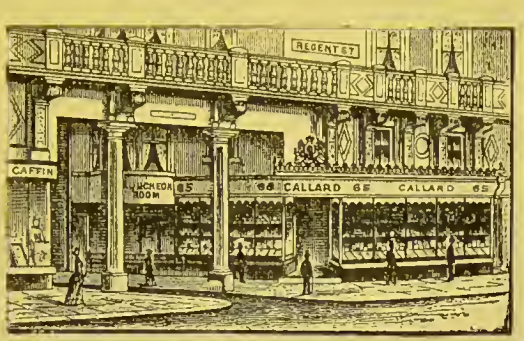

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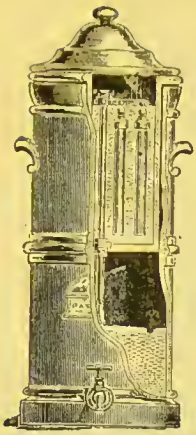

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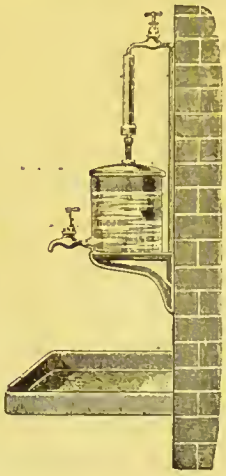

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